THE

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OF

THE ASIATIC SOCIETY

OF

BENGAL.

VOL. II.

THE

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OF

THE ASIATIC SOCIETY

OF

BENGAL.

EDITED BY

JAMES PRINSEP, F. R. S.

SECRETARY OF THE ASIATIC SOCIETY.

VOL. II.

JANUARY TO DECEMBER,

1833.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."

SIR WM. JONES.

Calcutta:

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1833.

PREFACE.

On completion of this second volume of the Journal of the Asiatic Society, the Editor feels it to be due to his subscribers, as well as to himself, to lay before them as briefly as possible, the results of the arrangements which he contemplated carrying into effect at the conclusion of the last volume;—more especially as a somewhat erroneous estimate of the cost and circulation of the Journal found admission into a late notice of the Indian Periodical Press, drawn up by the Editor of one of the morning papers. The Journal is not published, as there stated, by the Asiatic Society, but solely at the cost and responsibility of the Secretary, who was Editor of it before he enjoyed the honour of an election to that office. Since there never has been the least view to profit, either in the Gleanings or in the present work, there can be no object whatever in concealing any information respecting its publication; and it may be useful hereafter to find on record a note of the expences of printing, and the difficulties against which a Journal exclusively scientific has had to contend, as well as the advantages which it has enjoyed, in India at the present time. The following particulars have therefore been extracted from the accounts of the two years now terminated.

The amount of subscriptions to the Journal at one rupee per number, including two extra numbers, in 1832, was ..... Rs.		5148 8
From this, deducting 20 per cent. commission paid to Messrs. Thacker and Co. for circulating it, ...		1028 11
There remained net subscriptions available, Rs.		4114 13
The Baptist Mission Press charged for printing and stitching 500 copies, Rs.	3742 10	
And the 15 plates cost with printing,	416 5	
Total		4178 5

The result of the first year exhibits a sufficient accordance between outlay and return. Of the amount subscribed however, only Rs. 3786 13 have been collected up to the present time, so that in fact there was a deficit of Rs. 392 2.

The alterations which the Editor proposed and completed for the second year were :—

1. The saving of nearly half of the commission paid for the mere circulation of the work (without responsibility), by undertaking that duty with the aid of his establishment as Secretary of the Asiatic Society;

2. As a return for this favor, he proposed circulating the Journal gratis to such of the paying members as should express a desire to take it in.

The effect of this scheme has been as follows :

Fifty members of the Society have availed themselves of the privilege, which has made a deduction to the same amount from the monthly receipts. The number of copies circulated, including those sent to subscribers and societies in Europe, is about 450.

The number of paying subscribers on the list, is 320, which at 1 R. per month, (including one extra number of Buchanan,) would give Rs. 4480.

The expenses of printing 500 copies, of 670 pages,

at 4-5 per page, may be stated at	Rs.	2,890
144 pages of Buchanan, at 4-8 per page,.....		648
Covers, table work, &c. charged extra, ...		250
40 pages of Appendix, at 5 Rs.....		200
28 plates (18 lithographs, 10 engravings*), ...		480
Establishment for circulation, ...		600
		5,068

Leaving a loss on the year of Rs. 588, or nearly as much as the subscriptions of the members exempted from paying.

But it must be mentioned, and mentioned with a degree of disappointment which is almost disheartening, that of the flattering list of sub-

* For these the cost of printing and paper only is charged.

scribers above given, 70 have not paid any part of the year's subscription, and as many more are still in arrears; so that a balance of Rs. 1321-8 still remains to be collected. The actual state of the concern is therefore by no means so favorable as could be wished, for it leaves the Editor out of pocket upwards of 2000 Rs. as the reward of his labour for two years ! B əɥ ʇnwill not for a moment suppose that the balances outstanding are not recoverable : on the contrary the principal difficulty lies in the distance, and the supposed want of a mode of remittance.—Many subscribers are not aware, that letters containing hoondees for the amount may be transmitted *post free* to the Editor.

It will be remembered, that the Bengal Government were pleased to bestow the privilege of free postage on the GLEANINGS and on the JOURNAL, on condition of the publication of the late Dr. Buchanan's Statistical Reports. Under the impression (justly formed) of a corresponding increase of circulation, consequent upon this liberal boon, it was resolved not to incorporate these records in detached notices in the JOURNAL, nor to diminish from its original matter*, but to publish them as a separate work ; and one volume has accordingly been completed, containing 356 pages, which at 4·8 per page have cost Rs. 1,602

And a reprint of the first 108 pages, which became necessary on the subsequent extension of the edition from 300 to 500 copies, 216

Total, Rs. 1818

This expence has been incurred therefore on account of Government, in return for the postage saved, not to the work, but to the subscribers of the JOURNAL. On the completion of the first volume of BUCHANAN, a second extra volume of an official nature on the Monetary System was commenced, of which 50 pages have been printed with 3 plates, being in fact an expence of more than 300 rupees not included in the above estimate. The Government meantime placed the remaining volumes of Buchanan in the Editor's hands, with an intimation of its "desire that the printing of these records should be continued." It was therefore with no small feeling of mortification that

* Originally 32 pages only were given in each number, latterly 64.

the EDITOR perused the following letter, announcing that the privilege of free postage should cease from June next, especially after having been honored, on an explanation of the nature of the work, with an extension of the same privilege to the Madras presidency, in addition to that formerly bestowed by the Governors of Bombay and Ceylon.

To JAMES PRINSEP, Esq.

Editor of the Journal of the Asiatic Society,

Genl. Dept.

Sir,

I am directed to inform you, that the Governor General in Council has resolved, that after six months the exemption from postage, which is now enjoyed by the Journal of the Asiatic Society, shall be discontinued.

I have the honor to be,
Sir,
Your most obedient servant,
G. A. BUSHBY,
Offg. Sec. to Govt.

Council Chamber,
2nd Dec. 1833.

It may reasonably be feared that many subscribers at distant stations may be unable to continue their support to the work, when its cost shall be enhanced by postage; but (should it be impossible, on a proper and respectful representation of the circumstances, to avert the imposition of postage) every means will be taken of lessening the burthen by sending the monthly numbers by the bangy instead of the regular dâk.

On the contents of a volume which has already been perused by nearly all to whom it circulates, it would have been obviously needless to make any remark, were it not desirable to prove that the favors hitherto conferred upon the work by the Government of the country had not been altogether misapplied.

Independently of the volume of Dinajpur Statistics, which forms a model for the use of public officers engaged in collecting similar information, the GLEANINGS and the JOURNAL have been the means of bringing to notice many of the mineral resources of our vast Indian Empire, and of leading to fresh discoveries by the announcement of what had already been found: coal may be adduced as an example,—of which twenty or more different localities have been brought to our knowledge through its pages, where only two were before known. Of the native mineral productions, iron, copper, gold, &c.:—Of the native arts and manufactures, salt, nitre, turpentine, dyes, mills, &c. numerous original ac-

counts have been inserted : catalogues of woods, medicinal plants and drugs : experiments on materials, wood, iron, cement ;—Statistical reports;—descriptions of newly explored countries and people :—in fact, it would be difficult to open a number of the JOURNAL without finding some information which must possess value in the eyes of a government. Contributions of a more exclusively scientific nature have, in the mean time, continued to multiply, and the objects pointed out as desiderata at home in the geography, meteorology, geology, and natural history of this country, are in the course of rapid and systematic elucidation. So numerous for instance have been the registers of the weather offered for publication, that space could only be found for abstracts of many. There has hardly been time for the collection of materials regarding the tides of the Indian coasts, suggested in the Rev. Professor WHEWELL's circular, (inserted in page 151,) but the attention of those who have opportunities of eliciting the information required, is again solicited to this object.

As a proof of the benefit conferred on science by the free and extensive circulation of a periodical devoted to such objects, the Editor feels pride in alluding to the ardour which his plates of ancient coins have inspired in many active collectors, and above all to the reward bestowed on himself by the munificence of General VENTURA, the most successful pursuer of antiquarian research in the Panjáb, who has presented to him all the coins and relics discovered on opening the celebrated Tope of Manikyala. They are now on their way to Calcutta.

That extracts and analyses of European science have not been more frequent must be attributed once more to want of space and want of leisure. The Editor would recommend all who seek for knowledge of the progress of science in Europe to procure a copy of the Reports of the British Association for 1832, in which they will find every branch discussed by the philosopher best able to give it illustration. To attempt to shorten those admirable essays would be mutilation rather than abridgment; yet unfortunately most of them are too long for the pages of a monthly journal.

On the subject of orthography of native words, the Editor is driven to make one concession, for which he fears the learned Societies at home

will denounce him as an apostate to the system of their leader. Every communication, with hardly any exception, which comes for publication, adopts the Gilchristian mode of spelling, or that modification of it which has been *ordered* to be used in all Government records, surveys, &c. An attempt has been made hitherto to conform the whole to Sir William Jones' method, but necessarily there have been continual omissions, and the contributors in most cases express themselves but ill pleased to see their words transformed into shapes but ill accordant with ordinary *English* pronunciation. The Editor has therefore resolved to adopt the middle course followed in Hamilton's Hindustan, namely, to print all Indian names and words in the ordinary roman type as they are usually written and pronounced, and to place in italics all such native terms and proper names, as are corrected, and spelt according to the classical standard of Sir William Jones : in many cases the latter may be inserted in brackets after the ordinary word.

Where contributors have occasion to illustrate their papers by plates, it will be a great convenience to the Editor to have the original drawings prepared of the same dimensions as the printed page of letter press, to save the trouble and expence of reducing them.

The Editor will not allude in this place to the severe loss he has sustained in the death of some of the most able and constant supporters of his work, and the departure to Europe of others in the course of the past year; since he hopes that a more worthy channel will be found for the record of their meritorious labours for the cause of Science in India, in the Proceedings of the Asiatic Society, to which their names belong, and in which their reputation must ever be cherished with fond remembrance.

1*st January*, 1834.

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I.—*Origin and Classification of the Military Tribes of Népál. By* B. H. Hodgson, *Esq.*

[Read at the Meeting of the 9th January, 1833.]

The great aboriginal stock of the inhabitants of these mountains, east of the river *Káli*, or in *Népál*, is *Mongol*. The fact is inscribed, in characters so plain, upon their faces, forms, and languages, that we may well dispense with the superfluous and vain attempt to trace it historically in the meagre chronicles of barbarians.

But from the 12th century downwards, the tide of *Mussulmán* conquest and bigotry continued to sweep multitudes of the *Brahmans* of the plains from *Hindústán* into the proximate hills, which now compose the western territories of the kingdom of *Népál*. There the *Brahmans* soon located themselves. They found the natives illiterate, and without faith, but fierce and proud.

Their object was to make them converts to *Hindúism*, and so to confirm the fleeting influence derived from their learning and politeness. They saw that the barbarians had vacant minds, ready to receive their doctrines, but spirits not apt to stoop to degradation ; and they acted accordingly. To the earliest and most distinguished of their converts they communicated, in defiance of the creed they taught, the lofty rank and honors of the *Kshatriya* order. But the *Brahmans* had sensual passions to gratify, as well as ambition. They found the native females—even the most distinguished—nothing loath ; but still of a temper, like that of the males, prompt to repel indignities. These females would, indeed, welcome the polished *Brahmans* to their embraces : but their offspring must not be stigmatised as the infamous progeny of a *Brahman* and a *Mléchha*—must, on the contrary, be raised to eminence

in the new order of things introduced by their fathers. To this progeny also, then, the *Brahmans*, in still greater defiance of their creed, communicated the rank of the second order of *Hindúism*; and from these two roots, mainly, sprung the now numerous, predominant, and extensively ramified, tribe of the *Khás*—originally the name of a small clan of creedless barbarians, now the proud title of the *Kshatriya*, or military order of the kingdom of *Népál*. The offspring of original *Khás* females and of *Brahmans*, with the honors and rank of the second order of *Hindúism*, got the patronymic titles of the first order; and hence the key to the anomalous nomenclature of so many stirpes of the military tribes of *Népál* is to be sought in the nomenclature of the sacred order. It may be added, as remarkably illustrative of the lofty spirit of the *Parbattiahs*, that, in spite of the yearly increasing sway of *Hindúism* in *Népál*, and of the various attempts of the *Brahmans* in high office, to procure the abolition of a custom so radically opposed to the creed both parties now profess, the *Khás* still insist that the fruit of commerce (marriage is out of the question) between their females and males of the sacred order shall be ranked as *Kshatriyas*, wear the thread, and assume the patronymic title.

The original *Khás*, thus favored by it, became soon and entirely devoted to the *Brahmanical* system*. The progress of *Islám* below daily poured fresh refugees among them.

They availed themselves of the superior knowledge of the strangers to subdue the neighbouring tribes of aborigines, were successful beyond their hopes, and, in such a career continued for ages, gradually merged the greater part of their own habits, ideas, and language (but not physiognomy) in those of the *Hindús*.

The *Khás* language became a corrupt dialect of *Hindí*, retaining not many palpable traces (except to curious eyes) of primitive barbarism.

The *Ekthariahs* are the descendants more or less pure of *Rájpúts* and other *Kshatriyas* of the plains, who sought refuge in these mountains from the *Moslem*, or, merely military service as adventurers. With fewer aims of policy and readier means in their bright swords of requiting the protection afforded them than had the *Brahmans*, they

* That is, they agreed to put away their old gods, and to take the new; to have *Brahmans* for *Gúrús*; and not to kill the cow: for the rest, they made and still make sufficiently lightly of the ceremonial law in whatever respects food and sexual gratification. Their active habits and vigorous character could not brook the restraints of the ritual law; and they had the example of licentious *Brahmans* to warrant their neglect of it. The few prejudices of the *Khás* are useful rather than otherwise, inasmuch as they favour sobriety and cleanliness.

had less motive to mix their proud blood with that of the vile aborigines than the *Brahmans* felt the impulse of, and they did mix it less. Hence, to this hour, they claim a vague superiority over the *Khás*, notwithstanding that the pressure of the great tide of events around them has, long since, confounded the two races in all essentials. Those among the *Kshatriyas* of the plains, who were more lax, and allied themselves with the *Khás* females in concubinage, were permitted to give to their children, so begotten, the patronymic title only, not the rank. But their children again, if they married for two generations into the *Khás*, became pure *Khás*, or, real *Kshatriyas* in point of privilege and rank, though no longer so in name! They were *Khás*, not *Kshatriyas:* and yet they bore the proud cognomina of the martial order of the *Hindús*, and were, in the land of their nativity, entitled to every prerogative which *Kshatriya* birth confers in *Hindústán!*

Such is the third and less fruitful root of the *Khás* race.

The *Ekthariahs* speak the *Khás* language, and they speak no other.

The *Thákurís* differ from the *Ekthariahs* only by the accidental circumstance of their lineage being royal. At some former period, and in some little state or other, their progenitors were princes.

The *Sahí* are the present royal family.

The remaining military tribes of the *Parbattiahs* are the *Magar* and *Gúrúng*, who now supply the greater numbers of the soldiers of this state.

From lending themselves less early and heartily to *Brahmanical* influence than the *Khás* they have retained, in vivid freshness, their original languages, physiognomy, and, in a less degree, habits.

To their own untaught ears their languages differ entirely the one from the other, but, in very truth, only as remote dialects of one great tongue, the type of which is the language of Tibet. Their physiognomies, too, have peculiarities proper to each, but with the general *Calmuk* caste and character in both. The *Gúrúngs* are less generally and more recently redeemed from *Lámáism* and primitive impurity than the *Magars*.

But, though both *Gúrúngs* and *Magars* still maintain their own vernacular tongues, Tartar faces, and careless manners, yet, what with military service for several generations, under the predominant *Khás*, and what with the commerce of *Khás* males with their females*, they

* Here, as in the cases of the *Brahman* and *Khás*, and *Kshatriya* and *Khás*, there can be no marriage. The offspring of a *Khás* with a *Magarin* or *Gúrúngni* is a titular *Khás* and real *Magar* or *Gúrúng*. The descendants fall into the rank of their mothers, and retain only the patronymic.

have acquired the *Khás* language, though not to the oblivion of their own; and the *Khás* habits and sentiments, but with sundry reservations in favor of pristine liberty. As they have, however, with such grace as they could muster, submitted themselves to the ceremonial law of purity, and to *Brahman* supremacy, they have been adopted as *Hindús*. But partly owing to the licenses above glanced at, and partly by reason of the necessity of distinctions of caste to *Hindúism*, they have been denied the thread, and constituted a doubtful order below it, and yet not *Vaisya* nor *Sudra*, but a something superior to both the latter, what, I fancy, it might puzzle the *Shástrís* to explain on *Hindú* principles.

The *Brahmans* of *Népál* are much less generally addicted to arms than those of the plains; and they do not therefore properly belong to our present subject. The enumeration of the *Brahmans* is nevertheless necessary, as serving to elucidate the lineage and connexions of the military tribes, and especially of the *Khás*.

The martial classes of *Népál* are, then, the *Khás*, *Magar*, and *Gúrúng*; each comprising a very numerous clan or race, variously ramified and subdivided in the manner exhibited in the following tabular statement.

The original seat of the *Khás* is ordinarily said to be *Gorkhá*, because it was thence immediately that they issued, 70 years ago, under the guidance of PRITHVI NARAYAN, to acquire the fame and dominion achieved by him and his successors of the *Gorkháli* dynasty.

But the *Khás* were long previously to the age of PRITHVI NARAYAN extensively spread over the whole of the *Choubísya*; and they are now found in every part of the existing kingdom of *Népál*. The *Khás* are rather more devoted to the house of *Gorkhá*, as well as more liable to *Brahmanical* prejudices than the *Magars* or *Gúrúngs*; and, on both accounts, are somewhat less desirable as soldiers for our service than the latter tribes. I say somewhat, because it is a mere question of degree; the *Khás* having, certainly, no religious prejudices, nor probably any national partialities, which would prevent their making excellent and faithful servants in arms; and they possess pre-eminently that masculine energy of character and love of enterprize which distinguish so advantageously all the military races of *Népál*. The original seat of the *Magars* is the *Bára Mangránth, or Satahung, Payung, Bhirkot, Dhor, Garahung, Rising, Ghiring, Gúlmi, Argha, Khachi, Musikot, and Isma*; in other words, most of the central and lower parts of the mountains between the *Bhéri* and *Marsyándí** rivers.

* The *Marichangdi* of our maps.

The attachment of the *Magars* to the house of *Gorkhá* is but recent, and of no extraordinary or intimate nature. Still less so is that of the *Gúrúngs*, whose native seats occupy a line of country parallel to that of the *Magars*, to the north of it, and extending to the snows in that direction. Modern events have spread the *Magars* and *Gúrúngs* over most part of the present kingdom of *Népál*. The *Gúrúngs* and *Magars* are, in the main, *Hindús, only because it is the fashion*; and the *Hindúism* of the *Khás*, in all practical and soldierly respects, is free of disqualifying punctilio.

These highland soldiers, who despatch their meal in half an hour, and satisfy the ceremonial law by merely washing their hands and face, and taking off their turbans before cooking, laugh at the pharisaical rigor of our *sipáhís*, who must bathe from head to foot, and make *púja*, ere they begin to dress their dinner, must eat nearly naked in the coldest weather, and cannot be in marching trim again in less than three hours.

In war, the former readily carry several days provisions on their backs: the latter would deem such an act intolerably degrading. The former see in foreign service nothing but the prospect of glory and spoil: the latter can discover in it nothing but pollution and peril from unclean men and terrible wizards, goblins, and evil spirits. In masses, the former have all that indomitable confidence, each in all, which grows out of national integrity and success: the latter can have no idea of this sentiment, which maintains the union and resolution of multitudes in peril, better than all other human bonds whatever.

I calculate that there are at this time in *Nipal* no less than 30,000 *Dákhriahs*, or soldiers off the roll by rotation, belonging to the above three tribes. I am not sure that there exists any insuperable obstacle to our obtaining, in one form or other, the services of a large body of these men; and such are their energy of character, love of enterprise and freedom from the shackles of caste, that I am well assured their services, if obtained, would soon come to be most highly prized.

In my humble opinion they are by far the best soldiers in India; and if they were made participators of our renown in arms, I conceive that their gallant spirit and unadulterated military habits might be relied on for fidelity; and that our good and regular pay and noble pension establishment would serve to counterpoise the influence of nationality, especially in the *Magars* and *Gúrúngs*.

The following table exhibits a classified view of the *Brahmanical* and Military tribes, with their various subdivisions.

Tabular View of the Tribes.

BRAHMANS.

Arjâl.	Rûpâkhêti.	Osti.	Dhurâri.
Pondyâl.	Khativâra.	Utkûlli.	Bhúrtyâl.
Khanâl.	Dhakâl.	Kandariah.	Panêrû.
Rêgmi.	Adhikâri.	Ghart mêl.	Loityâl.
Bhattrâi.	Deoja.	Ghartyâl.	Sigdhyâl.
Nirôla.	Rukâi.	Nivapânya.	Barâl.
Achârya.	Sywâl.	Têmrâkoti.	Gotamya.
Bhatt.	Rijâl.	Uphaltopi.	Ghorasaini.
Sâpan kotya.	Dhúngyâl.	Parijai Kavala.	Risyâl.
Maharâshtra.	Loiyâl.	Homya Gâi.	Châlisya.
Kôirâla.	Dotiyâl.	Champa Gâi.	Dhôngâna.
Pakonyâl.	Kandyâl.	Gûra Gâi.	Bharâri.
Sattyâl.	Katyâl.	Subêri.	Bâgalya.
Dohâl.	Dangâl.	Pandit.	Dulâl.
Lamsâl.	Singyâl.	Têva pânya.	Parajuli.
Rimâl.	Bikrâl.	Timil Sina.	Bajgâi.
Dêvakotya.	Ukniyâl.	Kâphalya.	Satôla.
Parbatya Vash.	Bhattwâl.	Gaithoula.	Ghúrchôli.
Parbatya Misr.	Gajniyâl.	Gairaha Pipli.	Kêlathoni.
Davâri.	Chavala Gâi.	Ghimirya.	Gilal.
Koikyâl.	Vasta Gâi.	Simkhâra.	Lahôni.
Nepâlya.	Banjâra.	Phûnwâl.	Muthbari.
Barâl.	Dâgi.	Chamka saini.	
Pokaryâl.	Sôti.	Pûra saini.	

KHAS.

1*st. Subdivision of the Khás, called Thâpa.*

Bagyâl.	Gâgliyâ.	Powâr.	Khapotari.
Takuryâl.	Suyâl.	Ghimirya.	Parâjuli.
Palâmi.	Maharâji.	Khulâl.	Deoja.
Gûdâr.	Lâmichanya.	Sunyâl.	

2*nd. Subdivision of the Khás, called Bishnyát.*

Khulâl.	Khaputari.	Sripâli.	Puwâr.

3*rd. Subdivision, called Bhandári.*

Raghubansi.	Lâma.	Sijapati.

4*th. Subdivision, called Kárki.*

Sutâr.	Lâma.	Mûndala.	Khûlâl.

5*th. Subdivision, called Khangká.*

Powâr.	Maharâji.	Partyâl.	Khaputari.
Lakânggi.	Lâmichanya.	Khulâl.	Palpâli.
Kâlikotya.			

6*th. Subdivision,* or *Adhikari.*

Thâmi.	Tharirâi.	Pokriyâl.	Musiah.
Dhâmi.	Khadhsêna.	Thâkûri.	

7*th. Subdivision,* or *Bisht.*

Kâlikotya.	Puwâr.

8*th. Subdivision,* or *Kunwár.*

Bagâlya.	Khulâl.	Khangka.	Arjâl.

9*th. Subdivision,* or *Bániah.*

Sijapati.

10*th. Subdivision*, or *Dáni.*

Sijapati.	Powâr.		

11*th. Subdivision*, or *Gharti.*

Kalikotya.	Sijapati.		

12*th. Subdivision*, or *Khattri.*

Pândé.	Khulâl.	Lâmichânya.	Arjâl.
Tewâri.	Suvêri.	Dhakâl.	Sâpkotya.
Panth.	Poryâl.	Phanyâl.	
Adhikâri.	Sakhtyâl.	Burâl.	

True Khas not yet classified.

Dhongyâl.	Sijâl.	Satouya.	Rûpakhéti.
Loyâl.	Chouvala Gâi.	Parsâi.	Khatiwata.
Lamsâl.	Am Gâi.	Chalatâni.	Bhatt Râi.
Khukriyâl,	Baj Gâi.	Kilathoni.	Neopânya.
Dangâl.	Satya Gâi.	Muri Bhús.	Dalâl.
Sikhuniyâl.	Devakota.	Alphâltopi.	Sôti.
Bhiryâl.	Garhtôla.	Parijâi Kawala.	Osti.
Pouryâl.	Sêôra.	Bamankotya.	Bhatt Ojha.
Bikrâl.	Bâlya.	Tewâri.	Kadariah.
Kauhâl.	Gilâl.	Porsêni.	Kâla Khattri.
Batyâl.	Chonial.	Homya Gâi.	Dhúngâna.
Ganjâl.	Rêgmi.	Tûmurakot.	Pungyâl.

EKTHARYA, or *insulated tribes ranking with Khás.*

Bûrathoki.	Cholian.	Bohara.	Kutâl.
Râya.	Boghati.	Chiloti.	Dikshit.
Ravat.	Khatit.	Dângi.	Pandit.
Katwâl.	Sâvan.	Raimanjhi.	Parsâi.
Khâti.	Mahat.	Bhukhandi.	Chokhâl.
Maghati.	Barwâl.	Bhusâl.	Chohara.
			Durrah.

THAKURI, or *Royal lineages, ranking with Khás.*

Sâhi.	Singh.	Chand.	Jiva.
Malla.	Maun.	Hamâl.	Rakhsya.
Sêna.	Chohan.	Ruchâl.	

MAGARS.

I.—*Subdivision of the Magars, called Râná.*

Bhusâl.	Gyângmi.	Byângnâsi.	Kyâpchâki.
Aslâmi.	Pulâmi.	Phyûyâli.	Durra Lâmi.
Yahâyo.	Gâcha.	Lâmichânya.	Mâski.
Sârû.	Pusâl.	Gandharma.	Charmi.
Arghounlé.	Thâda.	Dûtt.	

II.—*Subdivision of Magars, called Thâpa.*

Grânjâ.	Chumi.	Kêli.	Barêya.
Namjâli.	Lûngèli.	Jhângdi.	Mâski.
Darrlâmi.	Sunâri.	Yângdi.	Phyûyâli.
Marsyângdi.	Chitouriah.	Jhâri.	Arghounlé.
Gelâng.	Sinjali.	Sârû.	Rijâl.

III.—*Subdivision of Magars, called Alaya.*

Yângmi.	Sarângi.	Pûng.	Lamjâl.
Súrya Vansi.	Gônda.	Sripâli.	Sûyâl.
Khâli.	Dukhchâki.	Sijapati.	Panthi.

Thokchâki.	Mèng.	Gharti.	Rakhâl.
Sithûng.	Maski.	Lâmichânya.	Palâmi.
Lahakpâ.	Arghounlé.	Khaptari.	Phyûyâli.
Kyapchâki.	Dûrrâ.	Khulâl.	Chermi.
Pachâin.			

GURUNGS.

Gûrûng.	Lâmichânya.	Khaptari.	Tangé.
Ghallé.	Siddh.	Ghûndâné.	Ghônyâ.
Byâpri.	Karâmati.	Dhârên.	Paindi.
Vumjan.	Gôsti.	Jimêl.	Mèngí.
Lâma.	Bagâlya.	Lopâté.	Dah Lâma.
Thâthûng.	Chandû.	Lothâng.	Kurângi.
Gôthi.	Chârki.	Bûlûng.	Khulâl.
Gondûk.	Khâti.	Shakya Lâma.	Surya Vansi Lama.
Gohori.	Guâburi.	Golângya.	Madân.
Barâhi.	Pengi.	Khangva.	Palâmi.
Ghârti.	Dhakarên.		

II.—*Description of Bokhára. By Lieut.* A. Burnes, *Bombay Army, Asst. Resident at Kutch.*

Our first care on entering *Bokhára* was to change our garb, and adopt the usages prescribed by the laws of the country. A petition to the minister might have perhaps relieved us of the necessity, but to do so was in consonance with our own plans, and we did not delay a moment in fulfilling them. Our turbans were exchanged for shabby sheep-skin caps with the fur inside, and our *kamarbands* were thrown aside for a rude piece of rope or tape. The outer garment of the country was discontinued, as well as our stockings, since these are the emblems of distinction in the holy city of *Bokhára* between an infidel and a true believer. We know also that none but a Muhammedan might ride within the walls of the city, and we had an inward feeling which told us to be heartily gratified if we were permitted, at such trifling sacrifices, to continue our abode in the capital. A couplet* which describes *Samarcand* as the paradise of the world, also names *Bokhára* as the strength of religion and of *Islám ;* and impious and powerless as we were, we could have no desire to try experiments among those who seemed, outwardly, at least, such bigots. The dress which I have described is nowhere enjoined by the *Qorán,* nor did it obtain in these countries for two centuries after the prophet; not till the bigotry of

* سمرقند صیقل روی زمین است
بخارا قوّت اسلام و دین است

some of the Khaliphs discovered that the faithful should be distinguished from those who were not Muhammedans.

On entering the city, the authorities did not even search us, but in the afternoon an officer summoned us to the presence of the minister. My fellow-traveller was yet prostrated by fever, and could not accompany me; I therefore proceeded alone to the ark or palace where the minister lived along with the king. I was lost in amazement at the novel scene before me, since we had to walk for about two miles through the streets of *Bokhára* before reaching the palace. I was immediately introduced to the minister, or as he is styled, the *Gosh Bègí*, an elderly man, of great influence, who was sitting in a small room, with a private court-yard in front of it. He desired me to be seated outside on the pavement, but evinced both a kind and considerate manner, which set my mind at ease. The hardness of my seat, and the distance from the minister, did not overpower me with grief, since his son, who appeared during the interview, was even further removed than myself. I presented a silver watch and a *Kashmír* dress, which I had brought for him; but he declined to receive anything, saying that he was but the slave of the king. He then interrogated me for about two hours, regarding my own affairs and the objects which had brought me to a country so remote as *Bokhára*. I told the usual tale of being in progress towards our native country, and produced my passport from the Governor General of India, which the minister read with peculiar attention. I then added, that *Bokhára* was a country of such celebrity among eastern nations, that I had been chiefly induced to visit *Turkistán* for the purpose of seeing it. But what is your profession, said the minister? I replied that I was an officer of the Indian army. But tell me, said he, something about your knowledge:—and he here entered upon various topics as to the customs and politics of Europe, but particularly of Russia, on which he was well informed. In reply to his inquiries regarding our baggage, I considered it prudent to acquaint him that I had a sextant, since I concluded that we should be searched, and it was better to make a merit of necessity. I informed him therefore that I liked to observe the stars, and the other heavenly bodies, since it was a most attractive study. On hearing this, the vizier's attention was roused, and he begged, with some earnestness, and in a subdued tone of voice, that I would inform him of a favorable conjunction of the planets, and the price of grain which it indicated in the ensuing year. I told him, that our astronomical knowledge did not lead to such information; at which he expressed himself disappointed. On the whole, however, he appeared to be satisfied of my character, and assured me of protec-

tion while in *Bokhára*; he however prohibited our using pen and ink, since it might lead to our conduct being misrepresented to the king, and prove injurious. He also added, that the route to the Caspian Sea by the way of *Khíva* had been closed for the last year; and that, if we intended to enter Russia, we must either pursue the northern route from *Bokhára*, or cross the *Túrkmán* desert below *Organj* to *Astrabád* on the Caspian.

Two days after this interview, I was again summoned by the vizier, and found him surrounded by a great number of respectable persons, to whom he appeared desirous of exhibiting me. I was questioned in such a way as to make me believe that our character was not altogether free from suspicion; but the vizier said jestingly, I suppose you have been writing about *Bokhára*. Since I had in the first instance given so true a tale, I had here no apprehensions of contradiction, and freely told the party that I had come to see the world, and the wonders of *Bokhára*, and that by the vizier's favor, I had been already perambulating the city. The minister was the only person who appeared pleased with the candour, and said that he would be happy to see me at all times in the evening: he inquired if I had any curiosity to exhibit to him, either of India or my own country; but I regretted my inability to meet his wishes. On my return home, it occurred to me that the all-curious vizier might be gratified by the sight of a patent compass, with its glasses, screws, and reflectors; but I also feared that he might construe my possession of this complicated piece of mechanism into a light which would not be favorable. I however sallied forth with the instrument in my pocket, and soon found myself in the presence of the vizier. I told him that I believed I had found a curiosity that would gratify him, and produced the compass, which was quite new and of very beautiful workmanship. I described its utility, and pointed out its beauty, till the vizier seemed quite to have forgotten, "that he was but a slave of the king, and could receive nothing;" indeed he was proceeding to bargain for its price, when I interrupted him. I assured him that I had brought it from *Hindústán*, that I might purposely present it to him; since I had heard of his zeal in the cause of religion, and it would enable him to point to the holy Mecca, and rectify the *Kibla* of the grand mosque, which he was now building in *Bokhára*. I told him, that I could receive no reward, since we were already rewarded, above all price, by his protection. The *Gosh Bègí* packed up the compass with all the haste and anxiety of a child, and said that he would take it direct to his Majesty, and describe the wonderful ingenuity of our nation. Thus fell one of my compasses. It was a fine

instrument, by Schmalcalder, but I had a duplicate, and I think it was not sacrificed without an ample return. Had we been in *Bokhára* in disguise, and personating some assumed character, our feelings would have been very different from what they now were. Like owls, we should only have appeared at night; but after this incident, we stalked abroad in the noon-tide sun, and visited all parts of the city.

My usual resort in the evening was the *Régistan* of *Bokhára*, which is the name given to a spacious area of the city near the palace, that opens upon it. In two other sides there are massive buildings, colleges of the learned; and on the fourth stands a fountain filled with water, and shaded by lofty trees, where idlers and newsmongers congregrate around the wares of Asia and Europe, which are here exposed for sale. A stranger has only to seat himself on a bench of the *Régistan*, to know the *Uzbèks* and the people of *Bokhára*. He may here converse with the natives of Persia, Turkey, Russia, Tartary, China, India, and *Kabúl*. He will meet with *Túrkmáns*, *Calmuks*, and *Kuzzaks*, from the surrounding deserts, as well as the natives of the more favoured lands. He may contrast the polished manners of the subjects "of the great King" with the ruder habits of a roaming Tartar. He may see the *Uzbèks* from all the states of *Máwarulnahr*, and speculate from their physiognomy on the changes which time and place effect among any race of men. The *Uzbèk* of *Bokhára* is hardly to be recognized as a *Turk* or Tartar, from his intermixture of Persian blood. Those from the neighbouring country of *Kokan* are less changed, and the natives of *Organj*, the ancient *Kharasm*, have yet a harshness of feature peculiar to themselves; they may be distinguished from all others by dark sheep-skin caps, about a foot high. A red beard, grey eyes, and fair skin will now and then arrest the notice of a stranger, and his attention will have been fixed on a poor Russian, who has lost his country and his liberty, and here drags out a miserable life of slavery. A native of the Celestial Empire will be seen here and there in the same forlorn predicament, shorn of his long cue of hair, with his crown under a turban, since both he and the Russian act the part of Muhammedans. Then follows a Hindú, in a garb foreign to himself and his country: a small square cap, and a string, instead of a girdle, distinguishes him from the Muhammedans, and, as the Moslems themselves tell you, prevents their profaning the prescribed salutations of their language, by using them to an idolator. Without these distinctions, the native of India is to be recognized by his sombre look, and the studious manner in which he avoids all communication with the crowd. He herds only with a few individuals, similarly circumstanced with himself. The

Jew is as marked a being as the *Hindú;* his costume differs from the follower of BRAHMA, and a small conical cap marks the children of Israel. No mark however is so distinguishing as the well known features of the Hebrew people. In *Bokhára* they are a race remarkably handsome, and I saw more than one Rebecca in my peregrinations. Their features are set off by ringlets of beautiful hair, which hang over their cheeks and necks. There are about 4000 Jews in *Bokhára,* originally from *Meshid* in Persia. They are chiefly employed in dyeing cloth. They receive the same treatment as the *Hindús.* A strayed Armenian, in a still different dress, represents that wandering nation; but there are few of them in *Bokhára.* With these exceptions, the stranger beholds in the bazars a portly, fair, and well-dressed mass of people, the Muhammedans of *Túrkistán.* A large white turban, and a *chogha* or pelisse of some dark colour over three or four other of the same description is the general costume; but the *Régistan* leads to the palace, and the *Uzbèks* delight to appear before their King in a mottled garment of silk, called "*adras,*" which is of all and the brightest colours, and would be intolerable to any but an *Uzbèk.* Some of the higher persons are clothed in brocade, and one may distinguish the gradations of the chiefs, since those in favour ride into the citadel, and the others dismount at the gate. Almost every individual who visits the King is attended by his slave; and though this class of people are for the most part Persians, or their descendants, they have a peculiar appearance. It is said, indeed, that three-fourths of the people of *Bokhára* are of slave extraction, for of the captives brought from Persia, into *Túrkistán,* few are permitted to return, and, by all accounts, there are many who have no inclination to do so. A great portion of the people of *Bokhára* appear on horseback. Whether mounted or on foot, they are dressed in boots, and the pedestrians strut on high and small heels on which it would puzzle a *Corinthian* to walk or even stand. They rise about an inch and a half, and the pinnacle is not one-third the diameter. This is the national dress of the *Uzbèk.* Some men of rank have a shoe over the boot, which is taken off on entering a room. I must not forget the ladies in my enumeration of the inhabitants. They generally appear on horseback, riding as the men; a few walk, and all are veiled with a black hair-cloth napkin. The difficulty of seeing through it makes the fair ones stare at every one as in a masquerade. There however no one must speak to them, and, if any of the King's harem pass, you are admonished to look in another direction, and get a punch on the head if you infringe the advice. So holy are the fair ones of the holy *Bokhára.*

My reader will have now become familiar with the appearance of the inhabitants of *Bokhára*. From morn to night, the crowd which assembles raises a humming noise, and one is stunned at the moving mass of human beings. In the middle of the area, the fruits of the season are sold under the shade of a square piece of mat, supported by a single pole. One wonders at the never-ending employment of the fruiterers in dealing out their grapes, melons, apricots, apples, peaches, pears, and plums; for the continued succession of purchasers proves that the tide of men still flows. With difficulty a passage can be forced through the streets, and it is only done at the momentary risk of being run over by some one on the back of a horse or an ass. These latter animals are exceedingly common and very fine, they amble along at a quick pace with their riders and burthens. Carts of a light construction are also driving up and down, since the nature of the country, and the streets which are not too narrow, admit of wheeled carriages in all parts of the bazar. Everywhere are seen people making tea, which is done in large European urns instead of tea-pots, and kept hot by a metal tube. The penchant of the *Bokharís* for tea is, I believe, without parallel; for they drink it at all times and places, and in half a dozen ways, with and without sugar, with and without milk, with grease, with salt, &c. Next to the venders of this hot beverage, one may purchase "rahet-i jan," or the delight of life, grape jelly or syrup mixed up with chopped ice. The abundance of ice is one of the greatest luxuries in *Bokhára*, and it may be had till the cold weather makes it unnecessary. It is pitted in winter, and sold so cheap that it is within the reach of the poorest people. No one ever thinks of drinking water without icing it, and a beggar may be seen purchasing it as he proclaims his poverty and entreats the bounty of the passenger. It is a nice and refreshing sight to see the huge masses of it with the thermometer at 90°, coloured, scraped, and piled into heaps like snow to tickle the *Uzbèks'* palate. It would be endless to describe the whole body of traders: suffice it to say, that almost every thing may be purchased in the *Régistan*; the jewellery and cutlery of Europe (coarse enough however), the tea of China, the sugar of India, the spices of Manilla, &c. &c. One may also add to his stores of learning, both *Túrkí* and Persian, at the book-stalls, where the learned or would-be-so pore over tattered pages at a hawker's board. As one withdraws in the evening from this bustling crowd to the more retired parts of the city, he treads his way through arched bazars, now empty, and passes mosques surmounted by handsome cupolas, and adorned by all the simple ornaments which are admitted by Muhammedans. After the bazar hours, these are crowded

for evening prayers. At the doors of the colleges, which generally face the mosques, one may see the students lounging after the labours of the day, not however so gay or so young as the tyros of an European university, but many of them grave and demure old men, with more hypocrisy, but by no means less vice, than their youthful prototypes in another quarter of the world. These people however are stained by vices which there find no shelter even among the most depraved libertines. With the twilight this busy scene closes, the King's drum beats, it is re-echoed by others in every part of the city, and at a certain hour no one is permitted to move out without a lantern. From these arrangements, the police of the city is excellent, and in every street large bales of cloth are left on the stalls at night in perfect safety. All is silence till the morn, when the bustle again commences in the *Régistan*, the busy hive of men. The day is ushered in with the same guzzling and tea-drinking, and hundreds of boys and donkeys laden with milk hasten to the busy throng. The milk is sold in small bowls, over which the cream floats: a lad will bring twenty or thirty of these to market, in shelves supported and suspended by a stick over his shoulder. Whatever number may be brought, speedily disappear among the tea-drinking population of this great city.

Soon after our arrival, I paid a visit to our late travelling companions, the tea merchants, who had taken up their abode in a caravansery, and were busy in unpacking, appraising, and selling their tea. They sent to the bazar for ice and apricots, which we sat down and enjoyed together. One of the purchasers took me for a tea merchant from the society I was in, and asked for my investment. The request afforded both the merchants and myself some amusement, but they did not undeceive the man on my mercantile character, and we continued to converse together. He spoke of the news of the day, the late conquests of the king at *Shahr Sabz*, and of the threats of the Persians to attack *Bokhára*, all without his ever suspecting me to be ought but an Asiatic. In return, we had visits from these merchants, and many other persons who principally came to gratify their curiosity. We were not permitted to write, and it was an agreeable manner of passing our time, since they were very communicative. The *Uzbèks* are a simple people, with whom one gets most readily acquainted: they speak in a curious tone of voice, as if they despised, or were angry with, you.

They never saluted us by any of the forms among Muhammedans, but appeared to have another set of expressions, the most common of which is, "May your wealth increase" *(doulat zyáda)*. They nevertheless

always said the "*fathaa*" or blessing from the *Qorân*, stretching out their hands and stroking down their beards before they sat down. Many of our visitors betrayed suspicions of our character, but still evinced no unwillingness to converse on all points, from the politics of their king to the state of their markets. Simple people, they believe a spy must measure their forts and walls, they have no idea of the value of conversation. With such ready returns on the part of our guests, it was not irksome for me to explain the usages of Europe; but let me advise a traveller to lay in a good stock of that kind of knowledge, before he ventures to travel in eastern countries. One must have a smattering of trade, arts, science, religion, medicine, and, in fact, of every thing; and any answer is better than a negative, since ignorance, real or pretended, is construed into wilful concealment.

I took an early opportunity of seeing the slave bazar of *Bokhára*, which is held every Saturday morning. The *Uzbèks* manage all their affairs by means of slaves, who are chiefly brought from Persia by the Túrkmans. These poor wretches are here exposed for sale, and occupy thirty or forty stalls, where they are examined like cattle, only with this difference, that they are able to give an account of themselves vivâ voce. On the morning which I visited the bazar, there were only six unfortunate beings, and I witnessed the manner in which they are disposed of. They are first interrogated regarding their parentage and capture, and if they are Muhammedans, that is, *Sunnis*. The question is put in that form, for the *Uzbèks* do not consider a *Shiah* to be a true believer, since with them, as with the primitive Christians, a sectary is more odious than an unbeliever. After the intended purchaser is satisfied of the slave's being an infidel (*kaffir*), he examines his body, particularly noting if he be free from leprosy, so common in *Túrkistán*, and he then proceeds to bargain for his price. Three of the Persian boys were for sale at thirty tillas of gold a piece*, and it was surprising to see how contented the poor fellows sat under their lot. I heard one of them telling how he had been seized south of *Meshid*, while tending his flock; another, who overheard a conversation among the bystanders regarding the scarcity of slaves that season, stated that a great number had been taken. His companion said with some feeling, You and I only think so, because of our own misfortune; but these people must know better. There was one unfortunate girl, but she had been long in service, and was now being sold by her master because of his poverty. I felt that many a tear had been shed in the court where I surveyed the scene, but I was assured from every

* 200 Rupees.

quarter that slaves are well treated and well fed, and the circumstance of so many of them remaining in the country after they have been manumitted seems to establish this fact. The bazars of *Bokhára* are chiefly supplied from *Organj*. Russians and Chinese are also sold but rarely. The feelings of an European revolt at this odious traffic; but the *Uzbèks* entertain no such notions, and believe that they are conferring a benefit on a Persian when they purchase him, in hopes that he may renounce his heretical opinions.

From the slave-market I passed on that morning to the great bazar, and the very first sight which fell under my notice was the offenders against Muhammedanism of the preceding Friday. They consisted of four individuals, who had been caught asleep at prayer time, and a youth who had been seen smoking in public. They were all tied to each other, and the tobacco-lover led the way, holding his *hooka* or pipe in his hand. The officer of police followed with a thick thong, and chastised them as he went, calling aloud, "Ye followers of Islam, behold the punishment of those who violate the law!" Never however was there such a series of contradiction and absurdity as in the practice and theory of religion in *Bokhára*. You may openly purchase tobacco, and all the most approved paraphernalia for inhaling its narcotic qualities; yet if seen smoking in public you are straightway dragged before the Qazi, punished by stripes, or paraded on a donkey with a blackened face, while the innocent hooka hangs before you as a warning to others. If a person is caught flying pigeons on a Friday, he is sent forth with the dead bird round his neck, seated on a camel. If seen in the streets at the time of prayers, and convicted of such habitual neglect, fines and imprisonment follow; yet there are bands of the most abominable wretches who frequent the streets in the evening, and encourage the violation of the *Qoran*. The laws of the Faithful punish this offence with death, but the Commander of the Faithful (the King is so called) sets an example to his subjects, and follows the customs of his fore-fathers. Every thing indeed presents a tissue of contradictions, and none were more apparent to me than the punishment of these culprits, who were marching with all the pomp of publicity, by the very gate way of the court, where human beings were levelled with the brutes of the earth, *no doubt* against the laws of humanity, but *as certainly* against the laws of Muhammed.

The *Hindús* of *Bokhára* sought our society with great avidity, for that people seem always to look upon the English as their superiors. They visited us in every country we passed, and would never speak any other language than *Hindústaní*, which seemed a bond of union between us and them. In this country they appear to enjoy a suffici-

ent degree of toleration to enable them to live happily. An enumeration of their restrictions might make them appear a persecuted race. They are not permitted to build temples, set up idols, or walk in procession; they do not ride within the walls of the city, and must wear a peculiar dress. They pay the *jizzya*, or capitation tax, which varies from four to eight rupees a year; but this they only render in common with others, not Muhammedans. They must never abuse or ill use a Muhammedan. When the King passes their quarter of the city, they must draw up and wish him health and prosperity. When on horseback outside the city, they must dismount if they meet His Majesty, or the *Qazí*. They are not permitted to purchase female slaves, as an infidel would defile a believer; nor do any of them bring their families beyond the Oxus. For these sacrifices, the *Hindús* in *Bokhára* live unmolested, and in all trials and suits have equal justice with the Muhammedans. I could hear of no forcible instance of conversion to *Islám*, though three or four individuals had changed their creed in as many years. The deportment of these people is most sober and orderly: one would imagine that the tribe had renounced laughter, if he judged by the gravity of their countenances. They themselves however speak highly of their privileges, and are satisfied at the celerity with which they can realize money, though it be at the sacrifice of their prejudices. There are about three hundred *Hindús* in *Bokhára*, and they live in a caravansery of their own. They are chiefly natives of *Shikárpúr*, in *Sinde*, and their number is on the increase. The *Uzbèks* and indeed all the Muhammedans find themselves vanquished by the industry of these people, who will stake the largest sums of money for the smallest gain.

Among the *Hindús* we had a singular visitor in a deserter from the Indian Army at Bombay! He had set out on a pilgrimage to all the shrines of the *Hindú* world, and was then proceeding to the fire temples on the shores of the Caspian. I knew many of the officers of the Regiment (the 24th N. I.) to which he had belonged, and felt pleased at hearing names which were familiar to me in this remote city. I listened with interest to the man's detail of his adventures and travels, nor was he deterred by any fear that I would *lodge information* against him and secure his apprehension. looked upon him as a brother in arms, and he amused me with many a tale of our friend Murad Beg of *Kúndúz*, whom he had served as a bombardier, and followed in his campaigns. This man, when he first shewed himself, was disguised in the dress of a pilgrim; but the carriage

of a soldier is not to be mistaken, though he has traversed the mountains and deserts to *Bokhára.*

The house in which we lodged was exceedingly small, and overlooked on every side; but we could not regret it, since it presented an opportunity of seeing a *Túrkí* beauty, a most handsome young lady, who promenaded one of the surrounding balconies, and *wished to think* she was not seen. A pretended flight was not even neglected by this fair one, whose curiosity often prompted her to steal a glance at the *Firingís.* Since we had a fair exchange, she was any thing but an intruder, though unfortunately too distant for us to indulge in the sweet "music of speech." The ladies of *Bokhára* stain their teeth quite black, they plait their hair and allow it to hang in tresses down their shoulders. Their dress differs little from the men; they wear the same pelisses, only that the two sleeves, instead of being used as such, are tucked together and tied behind. In the house even they dress in large Hessian boots, made of velvet and highly ornamented. What a strange taste for those who are eternally concealed, to choose to be thus booted as if prepared for a journey. On the head they wear large white turbans, but a veil covers the face, and many a lovely countenance wastes its fragrance beneath this netting. The exhibition of beauty, in which so much of a woman's time is spent in more favored countries, is here unknown. A man may shoot his neighbour, if he sees him on a balcony at any but a stated hour. Assassination follows suspicion. The laws of the *Qorán* regarding the sex are here most strictly enforced.

In my travels through *Cabúl* I had often enjoyed the luxuries of the bath, according to the custom of the Orientals. I now had the same pleasure in *Bokhára,* but it was only admissable in some buildings, since the priests had asserted that the water of certain baths would change into blood if polluted by a woman or an infidel! A bath is too well known to require a description, but the operation is really most singular. You are stretched out like a fish, rubbed with a hair brush, scrubbed, buffetted and kicked about, but it is still very refreshing. The baths of *Bokhára* are most spacious. They are constructed on the plan of a panoptagon, many smaller domes surrounding a great one, and heated to different temperatures. In the day time the light is admitted from coloured glasses over the large dome, in the night a single lamp under it suffices for all the cells. The portion of the circle towards *Mecca* is appropriated as a mosque, where the luxurious Muhammedan may offer up his orisons while he is enjoying one of the

promised blessings of his prophet's paradise. There are eighteen baths in *Bokhára*, one or two are of very large dimensions; but the generality of them bring in an annual income of 150 *tillas* (1000 Rupees). This is a calculation which may serve to number the inhabitants. Each individual pays to the keeper of the bath ten pieces of brass money, of which there are 135 in a rupee. About an hundred people may therefore bathe for a *tilla*, and 150 *tillas* will give 15,000 people to each bath. Eighteen baths will give a total of 2,700,000, who enjoy the luxury yearly. But the baths are only used during the cold months, and some of the poorer people are never able to afford the expense.

I did not omit to pay my respects to the minister while I rambled about the city, and Dr. Gerard in the course of ten days was sufficiently recovered to accompany me. The Vizier was equally inquisitive with the Nawab at *Cabúl* regarding the manufacture of medicines and plasters, and the Doctor endeavoured to meet his wishes. We had however got into a more civilized region on our approach to Europe, since the Vizier had received quinine and other medicines from Constantinople. We sat with the minister, while he was transacting business, and saw him levy his duties on the merchants, who were never more liberally treated in any country. The webs of cloth are produced, and every fortieth piece is taken in place of duties. This gives the merchant his profits, nor distresses him for ready-money. A Muhammedan indeed has only to take the name of the prophet, stroke down his beard, and declare himself poor, to be relieved from *all* duties. One man said he had witnesses to prove his being in debt, and would produce them. The minister replied, Give us your oath, we want no witnesses: he gave it, every one called out "God is great," and said the "*fátaha*," on which the goods were returned without an iota of charge. With every disposition to judge favourably of the Asiatics, (and my opinions regarding them improved, as I knew them better,) I have not found them free from falsehood: I fear, therefore, that many a false oath is taken among them. No people could be more liberal encouragers of commerce than the rulers of *Bokhára*. During the reign of the last monarch the duties on goods were never paid till they were sold, as in the bonding system of a British custom-house. The Vizier on this occasion conversed at great length on subjects of commerce relating to *Bokhára* and Britain, and expressed much anxiety to increase the communication between the countries, requesting that I myself would return to *Bokhára*, and not

forget to bring a good pair of spectacles for his use. Our intercourse was now established on a footing which promised well: I took occasion therefore to express a wish to the Vizier of paying my homage to the King. I had touched on a tender point, for it appeared that the minister had feared our being charged with some proposals to His Majesty, which we concealed from himself. "I am as good as the *Amír*," (so the King is called,) said he, "and if you have no matters of business to transact with the king, what have travellers to do with courts?" I told him of our curiosity on these points, but he did not choose that we should have the honor, and that was sufficient for abandoning the suit.

I was nevertheless resolved to have a sight of Royalty, and at mid-day on the following Friday repaired to the great mosque, a building of Timourlane, and saw His Majesty and his court passing from prayers. The King appears to be under thirty years of age, and has not a prepossessing countenance; his eyes are small, his visage gaunt and pale. He was plainly dressed in a silken robe of "*udrus*," with a white turban. He sometimes wears an aigrette of feathers, ornamented with diamonds. The *Qorán* was carried in front of him, and he was preceded and followed by two golden mace-bearers, who exclaimed in Turkish, "Pray to God that the Commander of the Faithful may act justly!" His suite did not exceed an hundred people; most of them were dressed in robes of Russian brocade, and wore gold ornamented swords—I should call them knives, the mark of honor in this country. His present Majesty has more state than any of his predecessors; but he may consider it necessary to affect humility in a temple, and in returning from a religious ceremony. The people drew up by the way side as he passed, and with a stroke of their beards wished His Majesty peace; I did the same. The character of this King, BAHADUR KHAN, stands high among his countrymen; at his elevation to the throne, he distributed all his wealth. He is strict in his religious observances, and less bigotted than his father MIR HYDER. He acts according to the *Qorán* in all cases, and it is pretended that he even lives on the capitation tax which is levied from the Jews and *Hindús*.

The revenues of the country are said to be spent in maintaining *mullahs* and mosques; but this young King is ambitious and warlike, and I believe that it is therefore more probable he turns his treasure to the increase of his power.

The life of this King is less enviable than that of most private men. The water which he drinks is brought in skins from the river,

under the charge and seal of two officers. It is opened by the Vizier, and first tasted by his people, and then by himself, when it is again sealed and dispatched to the King. The daily victuals of His Majesty undergo a like examination: the minister eats, he gives to those around him, they wait the lapse of an hour to judge of their effect, when they are locked up in a box and dispatched! His Majesty has one key and his minister another. Fruit, sweetmeats, and every eatable undergo the same examination, and we shall hardly suppose the good King of the *Uzbìks* ever enjoys a hot meal or a fresh-cooked dinner. Poison is in frequent request, as we may judge by the homely occupations of a minister of state. The rise of His Majesty himself to the throne he now holds is not however without strong suspicion of a free distribution of such draughts; but the detail of those events belongs to another portion of my subject.

I expressed a wish soon after reaching *Bokhára* to see some of the unfortunate Russians who have been sold into this country. One evening, a stout and manly looking person fell at my feet and kissed them. He was a Russian of the name of Gregory Pulukoff, who had been kidnapped when asleep at an outpost, about twenty-five years ago; he was the son of a soldier, and now followed the trade of a carpenter. I made him sit down with us, and give an account of his woes and condition. It was our dinner time, and the poor carpenter helped us to eat our pilao. Though but ten years of age when captured, he yet retained his native language, and the most ardent love to return to his country. He paid seven tillas a year to his master, who allowed him to practise his trade, and keep all he might earn beyond that sum. He had a wife and child, also slaves. "I am well treated by my master," said he, "I go where I chose, I associate with the people and personify the part of a Muhammedan, I appear happy, but my heart burns for my native land, where I would serve in the most despotic army with gladness. Could I but see it again, I would willingly die. I tell you my feelings, but I smother them from the *Uzbìks*. I am yet a Christian, (here the poor fellow crossed himself after the manner of the Greek Church,) and I live among a people who detest with the utmost cordiality every individual of that creed. It is only for my own peace that I call myself a Muhammedan." The poor fellow had acquired all the habits and manners of an *Uzbìk*, nor should I have been able to distinguish him but for his blue eyes, red beard, and fairer skin. He inquired of me with much earnestness if there were any hopes of him and his comrades being released; but I

could give him no further news than the floating rumours which I had heard of the Emperor's intention to suppress the traffic by an army. He told me that the last embassy to *Bokhára* under M. NEGRI had failed to effect that desired end, but that the sale of Russians had ceased in *Bokhára* for the last ten years. There were not at present 130 natives of Russia in the kingdom.

The whole of those in *Bokhára* would have been released by the Ambassador, had not some religious discussion arisen on the propriety of allowing Christians who had become Muhammedans to relapse into their idolatry! The *mullahs* had seen the pictures in the Greek Church, and no argument will reverse what they state to be the evidence of their senses, that the Russians worship idols. There is generally some difference of opinion on all points, and that of the Russians and *Bokhárís* on the subject of slavery was much at variance. The Muhammedans are not sensible of any offence in enslaving the Russians, since they state that Russia herself exhibits the example of a whole country of slaves, and particularly in the despotic government of her soldiery. "If we purchase Russians," say they, "the Russians buy the *Kazzaks* on our frontier. We are Muhammedans, and they tamper with these people by threats, bribery, and hopes to make them forsake their creed and become idolators. Look, on the other hand, at the Russians in *Bokhára*, at their liberty, comfort, and toleration, and compare it with the black bread and unrelenting tyranny which they experience in their native country, and which has on some occasions driven them voluntarily to us." We shall not attempt to decide between the parties, but it is a melancholy reflection on the liberties of Russia, that they admit of a comparison with the institutions of a Tartar kingdom, whose pity, it is said, is only upon a par with the tyranny of the *Afghan*.

With Russians, *Hindús*, and *Uzbèks*, our circle of acquaintance at *Bokhára* soon increased, and most of the *Afghan* and *Cabúl* merchants sought our society, and we could not but feel gratified at the favorable opinion entertained by them of the British in India. One of them, SIRWAR KHAN, a Lohanee merchant of great opulence, to whom we were never introduced, offered us any money we might require, and did it in a manner that left no doubt of his sincerity. We were assailed by him and his countrymen, and even by *Uzbèks*, to give notes of hand, certifying our acquaintance with them; for the *Afghans* believe the hand-writing to be a bond of union between Englishmen, and that the possession of it secures them an honorable reception in India. We complied with the wishes of those who deserved

our confidence. Among our other friends was a *Cashmír* merchant, who wished me much to assist him in the preparation of cochineal, which is, I believe, found in *Bokhára*, as a worm attached to the root of a wild shrub. There was also an old man named Haji Miruk, who had seen the world from Canton to Constantinople, and secretly brought many old coins and rarities which are acceptable to Europeans. The most intimate perhaps of all our acquaintance was our landlord, an *Uzbèk* merchant, named Makhsum, who traded to *Yárkand*. He paid us a daily visit, and generally brought some of his friends along with him. I shall mention an incident regarding this person, which is creditable to him. He was a most communicative man, and gave me much interesting information: as our intimacy increased, I interrogated him closely on the revenues and resources of *Bokhára*, on its extent and power, and produced a small map of the country to exhibit before him. He replied to all my inquiries, and then begging me to shut up the map, besought me never again to produce such a paper in *Bokhára*, since there were innumerable spies about the King, and it might be productive of very serious consequences. He still continued his visits, and his information with the same freedom as before. On our first arrival in the city, the keeper of the caravansary refused us quarters, because we had no character, that is, we were neither merchants nor ambassadors; but this good man had let his house to us. He had been attacked by his neighbours, terrified by his friends, and he himself trembled at the risk which he had incurred. The keeper of the caravansary now hid his head in shame, and the landlord shared our intimacy; his neighbours curried favor with him to be brought to us, and our society was more courted than was agreeable.

III.—*On the Climate of Nagpûr. By* W. Geddes, *Surgeon, Mad. Eur. Reg.*

To the Editor of the Journal of the Asiatic Society.

At the request of my friend, Mr. Malcolmson, of the left wing, Madras European Regiment, I have the pleasure to forward the result of some meteorological observations, which he tells me may be interesting to you. I am much afraid that he may have given you reason to expect more useful information on this subject than I have it in my power to give you; but the truth is, that I have generally confined my observations to the appearances on the sky, in the shape of clouds, and have paid less attention to the indications given by instruments; as I

have been so situated that I have either not had sufficient leisure to make a regular series of observations on the latter, or those instruments in my possession have not been sufficiently correct to allow me to depend much upon them. This you will at once observe from the circumstance of my barometrical inquiries being made on the sympiesometer, in the accompanying table; and you will perceive that the instrument I have, which was received here apparently in good order, in the month of January, 1831, from England, has become liable to the objections made to it, by yourself, in the 15th volume of the Asiatic Researches*, and this to such a degree, that I am doubtful whether you can make any use of the results which I now send you. They fully bear out however your own observations. In Europe, it appears, the instrument is conceived to rise in its indications, instead of lowering, as with us, at least if I may judge from a note made in the 10th volume of BREWSTER's Journal of Science; although, by the bye, the remark is rather obscure. With respect to the hygrometer used by me, it is one upon KATER's plan of the *oubína* grass†, made by ROBINSON, in Devonshire Street, which is convenient from the facilities of ascertaining its indications. Its extreme dryness is 0, extreme moisture 9.05, and the state of the atmosphere is at once shown from the index on the top of the instrument. By some trials made with DANIELL's hygrometer, 1.64 of KATER was equal to 31 degrees of dryness, and 1.96 of the former to 26 of dryness, and 3.69 to 10 degrees, as indicated by the dew-point on DANIELL‡. You will perceive that I have not made my observations at the extremes of the diurnal changes in the atmosphere; but as I have already said, I have been in the habits chiefly of noting the state of my instrument more as explanatory of the appearances on the sky, than with other objects, and have accordingly chosen the periods which were most convenient to myself, for recording their indications. The state of the seasons, as extracted from my medical reports, will explain some points regarding the thermometer, and the quantity of rain given is that observed to have fallen at Nagpúr at the distance of nine miles of this place, and which was recorded by Dr. WYLLIE, late Residency Surgeon there.

* Vide also GLEANINGS IN SCIENCE, i. 201.

† *(Andropogon contortum.)*

‡ As the temperature, at which these comparisons were made, is not mentioned, it is impossible to form a correct scale for KATER's hygrometer: the safest plan will be to assume that equal increments denote nearly equal accessions of aqueous tension; 9.05 being 100 or extreme moisture, each indication may be divided by 9 to find the tension roughly.—ED.

Meteorological Observations made at Kamptí, near Nagpúr, from Feb. 1831, *to March* 1833, *inclusive.*

Month.	Sympiesometer. 9 A. M. Highest.	Lowest.	Mean.	2 P. M. Highest.	Lowest.	Mean.	8 P. M. Highest.	Lowest.	Mean.	Kater's Hygrometer. 9 A. M. Highest.	Lowest.	Mean.	2 P. M. Highest.	Lowest.	Mean.	8 P. M. Highest.	Lowest.	Mean.	Fahr. Thermometer. Sunrise in the open air. Highest.	Lowest.	Mean.	2 P. M. in the house. Highest.	Lowest.	Mean.	8 P. M. in the house. Highest.	Lowest.	Mean.	Rain.
Feb. 1831,	29.24	28.91	29.02	29.13	28.72	28 87	29.12	28.75	28.92	—	—	—	—	—	—	—	—	—	68	54	62	85	70	76½	80	71	74½	,, ,,
March, ...	—.12	—.76	28.95	—.04	—.62	—.79	—.03	—.65	—.83	3.36	1.20	2.03	3.18	1.03	1.89	3.16	1.15	1.71	83	55	69½	88	72	80½	88	72	80	,, ,,
April, ...	28.92	—.54	—.74	28.80	— 40	—.60	28.82	—.45	—.63	2.63	0.53	1.77	2.30	0 48	1.54	2.47	0.45	1.48	86	69	78½	93½	83	88	93	80½	87	,, ,,
May, ...	—.59	— 32	—.49	—.46	—.20	—.35	— 47	—.22	—.39	1.22	0.33	0.69	1.03	0.32	0.62	0.94	0.25	0.58	93	80	88½	99	92	95½	98	93	95	,, ,,
June, ...	—.60	—.30	—.45	—.50	—.13	—.35	—.53	—.14	—.37	4.57	0.52	2.72	5.21	0.48	2.69	4.98	0.47	2.58	95	74½	81½	99	81	89½	99	82	89	13.78
July, ...	—.67	—.43	—.51	—.55	—.33	—.41	—.59	—.33	—.44	5.55	2.50	4.22	5.28	2.12	3.78	5.58	2.15	3.84	83½	73	78	93	76½	86½	91	80	85	7.22
August,...	—.67	—.43	—.55	—.56	—.35	—.46	—.60	—.37	—.49	5.75	4.57	5.49	5 72	3.87	5.10	5.70	4.53	4.97	78½	73	75½	86½	78½	82	83	79	81	14.58
September,	—.68	—.45	—.56	—.55	—.32	—.44	—.63	—.40	—.50	6.12	4.35	5.13	5.96	3.03	4.61	5.86	3.40	4.89	78	73	75½	85	79	82½	83	80	81½	11.98
October, ..	—.86	—.55	—.68	—.70	—.43	—.53	—.76	—.50	—.60	5.82	2.75	4.48	5.10	1.95	3.32	5.10	2.17	3.53	77	59	71	85	77	81½	84	76	81	7.24
November,	—.96	—.70	—.87	—.82	—.55	—.73	—.87	—.61	—.78	5.68	2.26	3.23	5.48	1.37	2.63	5.25	1.61	2.66	71	49	58½	81	71	74½	79	70	73	2.27
December,.	29.00	—.83	—.91	—.89	—.70	—.80	—.92	—.74	—.84	5.75	4.90	5.32	5.93	3.57	4.97	5.83	3.98	5.11	69	60	63	77	70	72½	74	70	72	8.24
Jan. 1832, .	—.05	—.87	— 98	—.87	—.70	—.77	—.93	—.80	—.84	5 03	2.50	3.49	3.75	1,35	2.51	3.82	1.45	2.99	62	47	52½	74	66½	69½	72	66	68½	,, ,,
February, .	28.94	—.61	—.78	—.77	—.42	—.61	—.84	—.46	—.69	5.58	1.99	3.09	5.67	1.20	2.45	5.27	1.27	2.61	66½	52	59	80½	68½	74	77	69	71½	2.98
March,....	—.81	—.52	—.64	—.61	—.30	—.44	— 68	—.37	—.50	3.56	1.16	1.73	3.88	0.91	1.22	3.16	1.03	1.31	70	53	62½	84	73	80	82	71	77	—.43
April, ...	—.54	—.22	—.36	—.36	—.05	—.18	—.42	—.06	—.24	1.62	0.53	0.97	1.23	0.33	0.66	1.35	0.32	0.71	82	70	75	99	87	93	92	83	87½	,, ,,
May, ...	—.26	—.06	—.15	—.12	27.93	—.04	—.13	27.98	—.05	1.47	0.56	0.81	* —	—	—	—	—	—	86½	71½	80	103	92	97	94	89	91½	,, ,,
June, ...	—.16	27.90	—.02	—.02	—.80	27.89	—.04	—.80	27.92	5.85	0.77	2.31	5.70	0.73	1.80	5 62	0.63	2.25	89½	75	81½	104½	82	94	93	82	88	8.01
July, ...	—.18	—.92	—.06	—.10	—.83	—.97	—.10	—.87	28 00	5.45	3.64	4.63	5.48	3.08	4.18	5.34	3.20	4.30	79	73½	76½	87	79	84½	86	79	83½	14.49
August,...	—.28	28.10	—.18	—.20	—.98	28.09	—.22	28.04	—.12	5.63	4.18	4.84	5.56	3.55	4.49	5 66	3.79	4.65	75	72	73½	83½	78	80	81½	78	79½	3.46
September,	—.38	—.15	—.26	—.13	28.00	—.14	—.30	—.08	—.20	5.78	3.08	3.99	5.81	1.66	2.74	5.72	2.26	3.45	75	68	72	86	75½	82	84	76½	81	7.77
October...	—.51	—.20	—.38	—.39	—.06	—.24	—.43	—.13	—.28	3.50	1.56	2.55	2.65	0.85	1.73	3.07	0.96	1.89	76	58½	67	85½	78	81½	84	77½	80½	,, ,,
November.	—.64	—.47	—.55	—.48	—.33	—.42	—.55	—.37	—.47	2.32	1.90	2.11	1.82	1.27	1.24	1.89	1.48	1.67	63½	54	58½	80	73½	76½	78½	73	75½	,, ,,
December,	—.66	—.39	—.52	—.54	—.26	—.37	—.60	—.31	—.44	3.70	1.31	2.10	3.08	1.14	1.74	2.98	1.14	1.75	62½	48	54½	77	67½	72½	74½	67½	71	,, ,,
Jan. 1833,.	—.72	—.40	—.58	—.55	—.28	—.43	—.64	—.32	—.49	3.04	1.30	1.78	2.60	1.08	1.54	2.71	1.33	1.68	65	47	55	78	68½	73	75	68½	72	,, ,,
February,.	—.52	—.32	—.43	—.35	—.16	—.26	—.42	—.21	—,31	2.40	0.75	1.37	1.99	0.62	1.06	1.87	0.72	1.07	68	50½	59	83½	72½	78	79	72	76	,, ,,
March,. ..	—.38	—.18	—.21	—.20	28.00	—.05	—.24	—.03	—.14	1.25	0.45	0.71	0.87	0.35	0.54	0.86	0.36	0.51	76½	60	68	89	80	85	87	79	84	,, ,,

* Vitiated by the influence of a wetted tatty.

Extracts of Meteorological Remarks made in the Periodical Returns from the Medical Department of the Right Wing, Madras European Regiment, stationed at Kampti.

First quarter of 1831.—" The period includes the last half of the cold and the commencement of the hot season. In January of the present quarter, the sky was for the most part clear throughout the month, the cloudy appearances never extending beyond a little cirrus, or cirro-cumulus, or a few cumuli dissolving in the evening; and the wind was most generally from some part of the west in the morning, and the east in the course of the day, but seldom blowing with great strength from any quarter, or continuing past sunset. The last day of January and first five days of February exhibited appearances of a more moist state of the atmosphere, with a greater variety in the cloudy formations, and there was a slight rain through the greater part of the second of this month, and again more heavily in the afternoon of the fourth. During the remainder of February, likewise, a greater degree of humidity prevailed, than in January, and nimbal masses were frequently to be seen around the horizon in the afternoon, or evening. The sky was generally covered with a layer, more or less dense or irregular, of a cirro-cumulous nature in the morning, and from this occasionally a few drops of rain were found to fall about sunrise, while cumuli succeeded to this in the course of the day. On the third the sky was obscured by a fog in the morning, and again on the 21st and 22nd a less degree of this description of cloud was present at the same time, in either case ending in cumuli. These cumuli, from whatever source originating, often changed into cirro-cumuli in the evening, and in other cases went on at an earlier part of the day, to form cumulo-strati, or nimbal clouds on various parts of the horizon. Excepting from the latter clouds, cirrus was but rarely seen, and there were only three perfectly clear days throughout the month. The wind, which was occasionally modified in the afternoon by the presence of clouds, observed the same general course as in January; but occasionally southerly wind began early in the forenoon, changing afterwards to one from the north-east, and this also was often found blowing more steadily than in the preceding month. The month of March presented occasional short periods of a moist description, having cumulo-stratus masses formed in the afternoon, and from one of these a considerable fall of rain took place on the night of the 10th. At other times, the appearances were much like those of the preceding months, but in a less degree, and the wind in general followed the same course as in February."

Second quarter of 1831.—"This period, as mentioned in former report, includes the height of the hot season, and the commencement of

the rains. The seasons in general in this country, succeed to each other with so much regularity, and each in its appropriate period exhibits so little variety in the circumstances of different years, that it appears unnecessary to enlarge upon those of the present season, further than to point at same period of last year. Referring therefore to my report for this quarter of 1830, I have to state, that the chief peculiarities of the present season have been a greater, and more continued, degree of heat, than in the hot months of last year, a somewhat more early occurrence of the rains, and their being in greater abundance than during the month of June, in 1830. In the beginning of April, several showers fell, and one* of these, on the 8th of the month, consisted of hailstones, the largest of which varied from six to nine inches in circumference. From this period, however, on to the commencement of the monsoon, with the exception of a few drops at distant periods, no rain took place, and this space of two months was one unbroken continuation of hot-weather. During this time a registering thermometer, exposed to a breeze in an outer room, shewed the rising of the quicksilver daily from the 27th of April to the 7th of June, with three exceptions, to from 100 to 107. To this succeeded the rains, which commenced on the afternoon of the latter date, and throughout the remainder of the month showers took place almost daily; the quantity of rain by the end of the month being nearly double that of the same period of last year."

Third quarter of 1831.—"This period comprises the chief part of the rains, and at the same time the most unhealthy portion of the year. As mentioned in last report, a great quantity of rain fell in June; but this was followed by a dry period of twenty days, viz. from the 22nd of June, until the 11th of July. The remainder of the latter month was, generally speaking, wet, especially towards the end of the month; but altogether the rain which fell in July was somewhat below the quantity in the same period of last year. The month of August in both years has been attended with the most continued rain of the season, and this has kept up a continued degree of moisture on the surface throughout the month. In September, there have been a few larger intervals of fair weather, but occasionally heavy falls of rain have taken place, and the ground has been in a constantly moist state in consequence. The monsoon, on the whole, has been accompanied with the average quantity of rain, the chief peculiarities being the extensive fall in June, and the succeeding dry weather until the middle of July. The wind, as usual, has been chiefly from the westward, and, at times, in the early part of the season, has blown with considerable strength.

* Vide page 5.

In the month of August, however, and more especially in September, there have been occasionally north or south easterly winds, and some of these have been attended with heavy falls of rain."

Fourth quarter of 1831.—"The weather throughout the quarter has shewn little of that settled appearance which formed its principal feature in the same period of last year, and which is usual at this season. A greater tendency to the formation of cloudy masses upon the sky, and the frequent deposition of rain from these, has continued to prevail after the termination of the usual rainy months, than was manifested during the same period of 1830, and has given altogether to the present season the peculiarity of a combination of cold and moisture; but, at the same time, a less degree of extreme heat and cold, than are usual at *Kamptí* at this period of the year. The rain has fallen particularly from the 15th to the 20th of October, in the first and last week of November, and in the beginning, and from the 15th to the 26th of December. The winds have in the intervals of settled weather followed their usual course in these months, of blowing slightly from the eastward in the fore and afternoons, and occasionally in the evening; while, in the night and morning, there has either been a calm, or a slight wind from the westward. In the more unsettled portions of the quarter, the wind has either been irregular, or modified by the presence or passage of raining clouds, or it has shifted from either the north-east or south, to another quarter, from whence it has blown for a day or two, and the change has been generally attended by a greater or less degree of rains."

First half yearly return of 1832.—"The period, comprising the last half of the cold season, the whole of the hot-weather, and the commencement of the rains, has altogether been a favourable one with respect to the health of the regiment: and this circumstance appears to be referrible to the genial nature of the season, the temperature of which remained cool to a much later period than is usual; while along with this coolness, there has been more generally present a dry state of the atmosphere, than in the same seasons of the preceding years. The extreme heat, in the table prefixed, of Fahrenheit's thermometer appears greater, from the observations being taken in the two latter months, on a registering thermometer, and the records being made from the hottest period of the day. The general features of the weather have, as recorded in former reports, consisted, in the early part of the half year, of cool, generally cloudless, days, with little wind, diversified on the 20th of February by a considerable fall of rain, with wind from the eastward; and, latterly, until the 8th of June there has been a gradual or irregular increase of temperature, with occasional

marks of greater moisture in the atmosphere; but excepting slightly on the 20th of March, no rain has fallen beyond a few drops till the period of June above-mentioned. The course of the season altogether has been observed to be more backward than is usual. The temperature has remained low to a later period; the progress of vegetation, as exhibited in the time of flowering of trees, and the maturation of their fruits, has been considerably behind what has been observed in previous years; and connected perhaps with the same cause, the rains have been beyond their more regular season of shewing themselves. Thus, after a little partial rain on the 8th of June, the hot winds recommenced, and there was no further fall of rain until the 17th of the month; since which period, till the date of this report, the season has resumed its usual course, and the weather has become moist and cool, with occasional falls of rain."

6th. Second half year of 1832.—"The period which includes the greater part of the rainy season, and half of the cold weather, has been distinguished by the abrupt cessation of the former, and the long continuance accordingly of a dry state of the atmosphere, with its necessary consequence of a less degree of moisture of the soil, and of vegetation; and, as will be supposed also, of sources of malaria. The regular rains may indeed be said to have terminated in the end of July in the present season; for in the month of August, in which usually the most continued or heavy falls take place, there has only been about a quarter of the usual supply, divided however very generally over the whole month; while in September, about half the quantity of the last two years has fallen, the greater part of which took place in the first four days of the month, and again on the 20th and 21st. Since this period, with the exception of a single shower on the 7th of October, and a slight rain on the 10th of December, the weather has been perfectly dry, exhibiting a settled appearance, with a cloudless sky; or it has been more or less disturbed by the presence of rain or storms in neighbouring latitudes, chiefly, it would appear, from other observations, to the eastward. Altogether, the quantity of rain of the present season does not exceed half of that of 1831, or two-thirds of 1830; and the fall is further peculiar in this, that unlike that of last year, which continued heavily on through the months of August, September, October, November, and December, and of 1830, which was also heavy in August and September, with a considerable fall likewise in October, the chief portion of the present year has taken place in the months of June and July, with only a scanty supply afterwards."

During the months of January, February, and March, 1833, the chief feature has been the continued dry state of the atmosphere; and, accord-

ingly, the cloudy appearances, which have for a day or two, at times, shewn a less degree of this state, have never gone on to rain further than a few drops; while the weather has generally continued for long periods of an extremely settled appearance.

The hail-storm on the 8th of April, 1831, was referred at the time to the occurrence of an opposite current of dry winds, which appeared to impinge upon the sheet of rain presented to its influence, and the following description, taken from notes immediately afterwards, seems to confirm this idea. Neither the sympiesometer or thermometer shewed any thing worthy of notice at this period. The hygrometer had through the 6th and 7th of the month ranged from 1.40 to 1.72, and during the 8th, it stood at 2.17 at 9 A. M., 2.12 at 2 P. M., and 2.22 at 8 P. M. Until past 2 P. M. the appearances on the sky had been cirrus from a distant nimbal cloud in the morning, cirro-cumulus, loose cirro-stratus, and some cumuli, passing below this, also of a loose structure. The wind had been blowing from the eastward in the morning, changing in the forenoon to the south-east, and continuing from thence afterwards; but towards 2 P. M. the course of the cumuli above shewed a current of air flowing there from the westward. Shortly after two, some distant thunder was heard, and the sky had become nearly covered with cirrus. Cumuli were observed to commence raining in the west, and they increased in size, and approached from that direction about 4 P. M. Another nimbus was seen in the south-eastward, while that in the west was advancing, and loud gusts of wind with much dust began blowing from the former towards the latter. In the mean time, the western cloud kept approaching, the rain falling from it, presenting a whitish appearance above the dust, some scud was seen passing before it, in a course towards the east, and immediately a heavy fall of hail took place, driven by a wind from the westward. The hail continued to fall for several minutes, and the course of the cloud towards the east could be traced for at least four miles, by the damage done to the fruit trees, glazed windows, &c. in the cantonment. The breadth of the shower however was extremely small, the ground being found quite dry at a few hundred yards to the southward from where the hail, or rather the masses of ice, fell in greatest quantity. These masses were irregular, and clean on the outer surface; but in the centre presented a white crystallized appearance. Throughout the evening afterwards, several large cumulo-strati were seen in the east, with much lightning there; and a cool breeze blew from thence, with cumulous fragments of cloud on a clear sky.

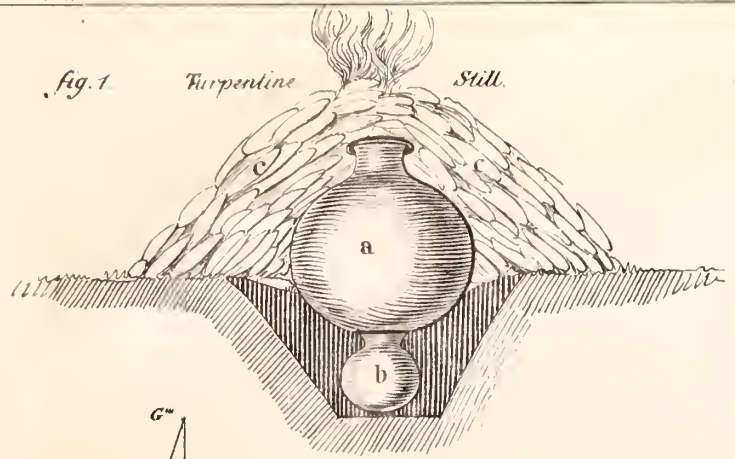
W. G.

IV.—*Table shewing the Rise of Spring tides in Bombay Harbour, during night and day, for the year* 1832, *communicated by* Ben. Noton, *Esq.*

Date and state of the Moon.		Rise of the Tide.				Date and state of the Moon.		Rise of the Tide.			
		Day.		Night.				Day.		Night.	
		ft.	in.	ft.	in.			ft.	in.	ft.	in.
January	14	0	0	14	6		11	0	0	14	6
	15	13	6	16	0		12	13	9	15	6
	16	14	3	16	5		13	14	6	15	9
	○17	15	0	17	9		14	15	6	16	0
	18	15	9	17	11		○15	15	9	16	0
	19	16	0	17	11		16	16	0	15	5
	20	16	0	17	6		17	15	8	14	6
	21	15	6	0	0		18	15	2	0	0
	28	0	0	12	6		26	0	0	12	9
	29	11	3	13	6		27	12	9	13	9
	30	12	0	14	3		28	13	6	14	3
	31	12	6	15	0		29	14	6	14	9
February	1	13	2	15	5		●30	15	6	15	0
	● 2	13	6	15	7	May	1	16	3	15	5
	3	14	0	15	7		2	16	7	15	3
	4	14	2	0	0		3	16	9	0	0
	12	0	0	13	6		10	0	0	13	3
	13	12	6	14	8		11	13	3	14	0
	14	13	6	15	9		12	14	3	14	3
	15	14	6	16	9		13	14	9	14	3
	○16	15	3	17	5		○14	15	0	14	3
	17	16	9	17	5		15	15	0	13	9
	18	15	9	17	0		16	14	9	13	3
	19	15	3	0	0		17	14	3	0	0
	27	0	0	11	6		26	0	0	13	0
	28	11	0	12	9		27	13	6	13	6
	29	11	6	14	0		28	14	6	14	3
March	1	13	0	15	0		29	16	0	14	6
	● 2	14	0	15	9		●30	16	3	14	6
	3	14	6	15	9		31	16	9	14	6
	4	15	0	15	6	June	1	16	9	14	3
	5	14	9	0	0		2	16	6	0	0
	12	0	0	13	6		9	0	0	13	0
	13	12	6	15	0		10	14	0	13	6
	14	14	0	16	3		11	14	9	14	0
	15	14	9	16	9		12	15	3	14	3
	○16	15	6	17	0		○13	15	6	14	6
	17	15	9	17	0		14	15	9	14	9
	18	16	0	16	6		15	15	11	14	9
	19	16	0	0	0		16	15	9	0	0
	27	0	0	12	3		24	0	0	13	0
	28	11	6	13	6		25	14	0	14	0
	29	12	9	14	9		26	15	6	14	6
	30	13	9	15	0		27	16	6	14	9
	31	14	6	15	3		●28	17	0	15	0
April	● 1	15	3	15	9		29	17	6	15	3
	2	15	9	16	0		30	17	9	14	9
	3	16	0	0	0	July	1	17	3	0	0

Date and state of the Moon.		Rise of the Tide. Day. ft.	in.	Night. ft.	in.	Date and state of the Moon.		Rise of the Tide. Day. ft.	in.	Night. ft.	in.
July	8	0	0	12	0	October	5	0	0	11	6
	9	13	0	12	6		6	12	9	12	6
	10	13	9	12	9		7	13	9	13	6
	11	14	3	13	0		8	14	0	14	3
	12	14	7	13	0		9	14	5	15	0
	○13	14	7	13	0		○10	15	0	15	3
	14	14	11	13	0		11	15	0	15	6
	15	14	11	0	0		12	14	9	0	0
	23	0	0	12	0		20	0	0	13	9
	24	14	0	13	0		21	14	9	14	9
	25	15	3	14	0		22	15	3	15	6
	26	16	3	15	0		23	15	6	16	3
	●27	17	3	15	6		●24	15	6	16	3
	28	17	6	16	0		25	15	3	16	0
	29	17	9	16	3		26	14	9	15	6
	30	17	3	0	0		27	13	5	0	0
August	7	0	0	11	9	November	4	0	0	12	6
	8	13	3	12	3		5	13	3	13	16
	9	14	3	12	8		6	13	9	14	6
	10	14	6	13	3		7	14	3	15	9
	○11	14	9	13	6		○ 8	14	9	16	3
	12	15	0	13	10		9	14	11	16	6
	13	15	1	13	10		10	14	7	16	3
	14	15	1	0	0		11	14	0	0	0
	22	0	0	12	3		18	0	0	14	0
	23	14	3	13	3		19	14	0	14	9
	24	15	6	14	6		20	14	6	15	6
	25	16	6	15	0		21	14	9	16	3
	●26	16	9	15	9		●22	14	9	16	3
	27	16	9	16	0		23	14	3	16	3
	28	16	9	15	9		24	14	0	15	9
	29	16	3	0	0		25	13	6	0	0
September	5	0	0	11	6	December	3	0	0	13	0
	6	12	9	11	9		4	13	0	14	0
	7	13	6	12	6		5	13	6	15	0
	8	14	3	13	3		6	14	3	16	6
	9	14	9	14	0		7	14	9	17	0
	10	15	0	14	3		○ 8	15	0	17	8
	○11	15	3	14	6		9	15	0	17	8
	12	15	3	0	0		10	15	0	0	0
	20	0	0	12	0		18	0	0	14	0
	21	14	3	13	0		19	13	3	14	9
	22	15	0	14	3		20	13	3	15	3
	23	16	0	15	3		21	13	3	15	9
	●24	16	3	15	10		●22	13	6	16	0
	25	16	3	16	0		23	13	6	16	0
	26	16	0	15	6		24	13	0	15	3
	27	14	9	0	0		25	13	0	0	0

fig. 1. Turpentine Still.



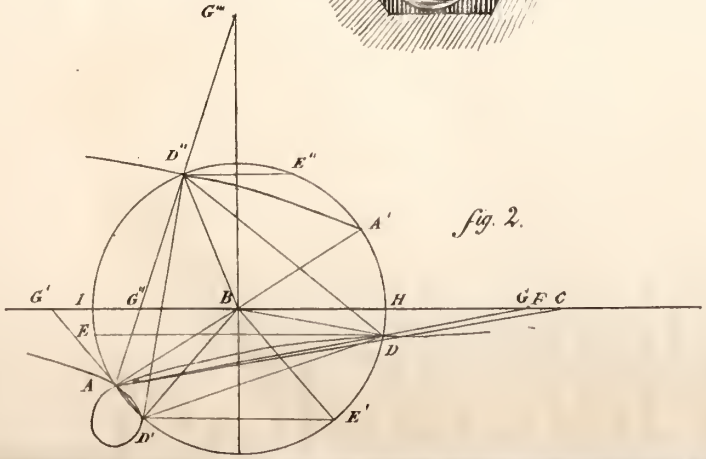


fig. 2.

Plan of a Sun dial at Agra

fig 3.

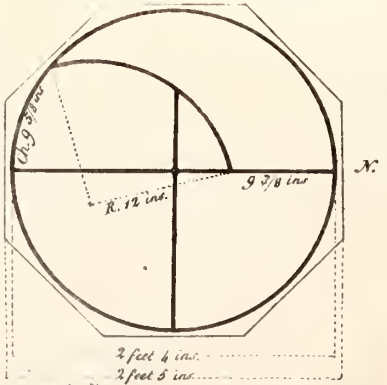
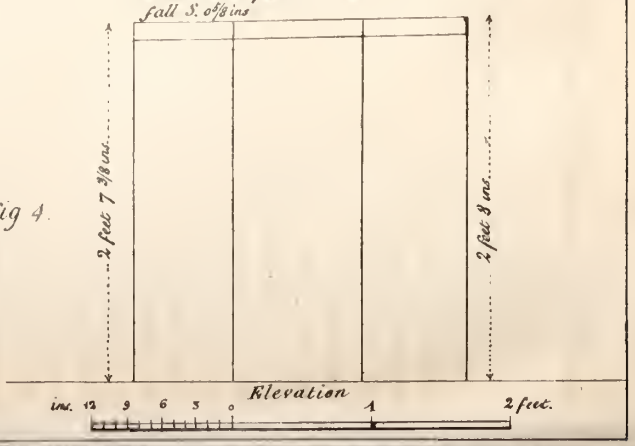


fig 4.



V.—*On the Native Manufacture of Turpentine.*

It would be an useful point of inquiry to discover in how far we may turn the natural as well as artificial products of this country to account, without looking elsewhere, and particularly to England: in the shape of magazine stores, Government has from the beginning been importing articles of various descriptions at a great expence, and at great risk; many of which are not only procurable in the country, but to be purchased at a rate much lower, and of a quality infinitely superior, to those from England. No person acquainted with the interior of an arsenal or magazine, who has given the matter any consideration whatever, can be at a loss to see how the question applies, and both as a matter of economy, and as a method of introducing stores of a better description into the public depôts, a professional officer could not better apply his attention, than in endeavoring to prove to Government the value of such an inquiry. I will, as opportunity offers, bring forward points that come under my immediate observation; and although to many people the subjects of discussion may appear trifling and uninteresting, or unworthy of that consideration, that I am inclined to give them, it must still be recollected, that a very trifling saving on the *rate* of an article much in requisition is a matter of considerable importance, where the consumption of the article in question is great.

In commencement of the subject, I will take the common fir (Pinus longifolia), native name *chír*, in great abundance in the lower line of hills that skirts the *Dúns*, or valleys (at the foot of the Himálayas), and separating them from the plains. From this tree the natives obtain, in their rough way, tar and turpentine, and use the wood for work where lightness is required. The tar made by them, I imagine, is equal to that obtained by a more refined process, and the turpentine merely requires that attention which every establishment under the eye of skilful management could give, in producing the article as good as that from Europe. The method of obtaining tar, as put into practice by the natives at the foot of these hills, is more simple, and apparently better than what is described as the custom in Norway, and other countries in Europe, where tar is made by the foresters. The wood selected for the purpose is that which has either been cut or blown down the previous season, and which is dry. This is cut up into small pieces, and put into large earthen pots, holding about 10 seers (or *gurtass)*, with narrow necks, through the bottom of which holes of about $\frac{1}{5}$ of an inch have been drilled. A pot so filled with the wood is then luted over with wet mud on the top and sides, and a hole being dug in the

ground, a smaller pot, holding about $\frac{3}{4}$ of a seer of the same description as the above, is placed in it, over which the large one is put, and the space round refilled with earth; a heap of cow-dung, about 15 seers, is then piled over the whole, (which during the operation requires replenishing with about an equal quantity;) this is set fire to, and kept burning for about eight or nine hours, after which, the pots are removed, and the tar which has run off into the lower vessel, is put aside into a receptacle for that purpose: each pot runs off about five chittaks of tar, and gives a refuse of about a seer of charcoal—five men will make about two maunds and 10 seers, or nine of these pots full of tar, during the month, and the expence of the article will be as follows:

1. One head man, at per month,.....	5	0	0
Four men, at each four rupees,.....	16	0	0
Purchase of pots and sundries,.....	1	0	0
Total,.....	22	0	0

Which on $2\frac{1}{4}$ maunds will give a rate per seer of three annas and 11 pie, nearly, from which is to be deducted the value of the charcoal, which in a large manufactory is considerable; in the above seven maunds, 35 seers, which in the forests would sell for two rupees, reducing the rate per seer of tar to three annas seven pie nearly. This tar is used on the boats on the Doab Canal, and also on the wood-work of the dams and regulating bridges, and wherever a weather boarding mixture is required; and I believe it may be recommended in every way. The common native turpentine is used also with the tar for these purposes. The fir wood itself is good for boxes, table, planks, and articles of that description, and also makes floats for rafting the heavier varieties of wood: it has also been used in making boats, (an experiment tried from its lightness, and cheapness of working,) but without that success that was anticipated, the planking having become completely rotten and unserviceable after the work of two seasons. The natives hold the wood in no esteem whatever, but experience has shewn that for the purposes above-mentioned, namely for boxes, &c. this fir is as good as the common deal, and from its excessive lightness is certainly to be highly prized.

Fig. 1, of Plate IX. exhibits a sectional view of the simple turpentine-still of the natives; *a* is the vessel in which the wood is heated; *b* that in which the turpentine is collected.

B.

Northern Doab, March 26th, 1833.

VI.—*Description of a Sun Dial in the Court of the Motí Masjíd, in the Fort of Agra. By Capt.* J. T. Boileau, *Engineers.*

Among the curiosities of this once great emporium of learning and art, which have attracted the attention of strangers, is a dial-plate of white marble, with lines inlaid on its surface of a black slate; similar to the accompanying sketch. The style, which appears to have been an upright round pin, is gone, and the inlaying has been pulled out; but the configuration of the lines is still perfect, being marked by the channels wherein the inlaying fitted. The breadth of these channels is about $\frac{3}{8}$th of an inch.

The dial-plate is set up in the court of the *Motí Masjíd*, a building which was constructed in the latter end of the reign of Aurangzib, about the year 1673, and it is probable that this dial was put up about the same time; but whether in its present site and position, or elsewhere, I have not been able to ascertain.

The absence of hour lines, excepting XII and VI A. M. and P. M. would lead to the supposition, that the object for which the dial was constructed had reference only to the times of Mussulman prayer; but the object of the circular arc, which subtends an angle of about 95 degrees, has never been explained, although many celebrated *Moulavís* have visited the *Masjíd* and examined the dial as it stands.

The surface of the dial inclines south about $\frac{3}{8}$ths of an inch, which leads me to believe, that it has been removed from the place where it was originally fixed; for the inclination is too small to affect the projection of the shadow of the gnomon in any sensible degree, and I believe, therefore, that it stood originally in a perfectly horizontal position.

With regard to the true north point of the dial, it is difficult from the mere inspection of the lines upon it to come to any determination. The *Motí Masjíd* stands in lat. 27° 9′ nearly, and the sun's greatest declination N. being 23° 27½′, he of course can never approach nearer our zenith than 3° 41′ to the south. It is not possible, therefore, that the circular arc, which is inclined about 29° to the present meridian line, could under any circumstances mark the path of the shadow of a style placed as the style of this dial was, in a vertical position.

Agra, March 21st, 1833.

VII.—*Catalogue of the most remarkable Celestial Objects visible in the horizon of Calcutta, arranged in order of Right Ascension.*

We have obtained permission to give publicity to the following catalogue, which was drawn up by Sir J. S. W. HERSCHELL, to accompany the ten feet reflecting telescope sent out to India by that distinguished astronomer for the private use of his relations in this country. It will of course answer equally well for other telescopes, and will in some measure serve as a test of their goodness and space-penetrating power.

The names and numbers in the last two columns refer to BODE's maps of the constellations, which afford a ready means of finding the place of the object in the heavens, as they represent the stars of the celestial sphere *direct*, whereas upon the globe they are necessarily reversed. But to those who do not possess BODE's maps, the right ascension and declination will, with a little more trouble, enable the common observer to discover their position, while the astronomer with his transit will find out the whole with ease*.

Explanation of the signs used in the Catalogue.

Column 1, contains an enumeration of the whole. One asterisk (*) placed against a number denotes that the object is striking; two asterisks (**) that it is particularly curious.

Column 2, contains the right ascension in hours, minutes, and seconds.

Column 3,——— the declination in degrees and minutes.

Column 4, N and S, indicate whether the declination is north or south.

Column 5, gives the authority whence the objects are extracted. The Roman numbers 'I. II. III.' &c. refer to Sir W. HERSCHELL's catalogue of nebulæ and double stars by classes.

△ refers to DUNLOP's catalogue of southern nebulæ.

△′ ditto to ditto, double stars.

M ditto to Messier's nebulæ.

Column 6, describes the object by the following signs.

N, nebula.

D, double.

⊕, globular cluster.

○, planetary nebulæ.

, cluster of irregular figure.

⊙, nebulous star.

Column 9, refers to the numbered maps of "*Bode's Constellations.*"

* Our readers will remember the announcement at Bombay, in October last, of the discovery of Biela's Comet, which from its being so stationary was supposed to be coming direct towards the earth: the situation of the object proved it to be the nebula in Andromeda, No. 3. When really seen by Sir John HERSCHELL on the 23rd September and again in November, the comet did however really appear exactly similar to a faint circular nebula.

	R. Ascension.	Declination.	N. or S.	Authority.	Obj.	Description of Object.	Constellation.	No. of Map.
	h. m. s.	° ′						
1	0 6 50	40 10	S.	Δ 507	N.	"A beautiful long nebula."	Apparatus Sculptoris.	17
2	0 23 16	63 56	S.	Δ′ 1	D.	β Toucani. iv. class. 4th=4th mag. a superb D. Star—but barely rises above the Calcutta horizon.	Toucan.	20
**3	0 33 26	40 21	N.		N.	The great nebula in Andromeda.	Andromeda.	4
4	0 38 51	56 55	N.		D.	η Cassiopeiæ. A *Binary* star, of finely contrasted colours.	Cassiopeiæ.	4
*5	0 39 13	26 16	S.	V. 1	N.	A very large long neb.	Cetus.	17
6								
7	1 4 6	6 39	N.		D.	ζ Piscium.	Pisces.	11
8	1 19 43	33 31	S.	Δ′ 3		"A star 7m of a very uncommon red-purple colour. Very dusky, &c."	Machina electrica.	17
9	1 24 15	29 52	N.	M. 33	⊗	A fine large cluster, 18′ diameter.	Pisces.	11
10	1 44 13	18 27	N.		D.	γ Arietis, 2nd or 3rd class.	Aries.	11
11	1 47 20	36 55	N.	VII. 32	⊗	A large and very rich cluster.	Andromeda.	4
*12	1 53 16	1 56	N.		D.	α Piscium. II Class.	Pisces.	11
13	1 53 29	41 31	N.		D.	γ Andromedæ. A superb double star of strongly contrasted colours.	Andromeda.	4
14	2 6 53	56 22	N.	VI. 33	⊗	A pair of fine rich clusters, almost joining.—In the sword-handle of Perseus.	Perseus.	4
15	2 9 46	56 21	N.	VI. 34	⊗			
*16	2 31 0	41 59	N.	M. 34	⊗	The Brilliant cluster in Perseus.	Perseus.	4
17	2 34 12	0 44	S.	M. 77	N.	Very bright nebula.	Cetus.	17
18	2 51 19	41 0	S.	Δ′ 9	D.	θ Eridani. Magn. 4 and 6 ; dist. 10″.	Eridanus.	20
19	3 7 47	55 55	S.	Δ 337	⊕	A small bright globular cluster.	Horologium.	20
20								
21	3 51 40	60 25	N.	IV. 53	○	A pretty bright planetary nebula. 1′ diam. invis. to naked eye.	Camelopardalis.	5
22	3 58 28	30 20	N.	IV. 69	◎	A star 8m with a nebulous atmosphere. A most curious object, but probably difficult to find, being invisible to the naked eye.	Perseus.	4
23	4 6 38	13 11	S.	IV. 26	○	A very bright planetary nebula.	Eridanus	17
24	4 43 52	28 14	N.			A ruby-coloured star 8m.	Taurus.	12
25	5 6 22	8 24	S.		D.	Rigel. The companion is very small, and only 9″ distant from the large star.	Orion.	12
*26	5 7 0	40 15	S.	Δ 508	⊕	Described by Dunlop, as the brightest small nebula he has seen, diam. 1′½.	Cœla.	18
27	5 14 34	35 38	N.	M. 38	⊗	The cluster in Auriga.	Auriga.	5
*28	5 24 8	21 49	N.	M. 1	N.	An irresolvable nebula (near	Taurus.	12

	R. Ascension.	Declination.	N. or S.	Authority.	Obj.	Description of Object.	Constellation.	No. of M.
						ζ Tauri). A very curious object.		
*29	5 24 40	34 11	N.	M. 36	⊛	Large brilliant cluster in Auriga.	Auriga.	5
30	5 25 36	9 49	N.		D.	λ Orionis.	Orion.	12
*31	5 27 13	5 31	S.		⊙	The great nebula about θ Orionis. The most extraordinary object perhaps in the heavens.	Orion.	12
32	5 32 6	2 4	S.		D.	ζ Orionis. Very close. Difficult.	Orion.	12
33	5 32 37	9 0	N.	IV. 34	○	Planetary nebula.	Orion.	12
34	5 58 26	24 3	N.	M. 35	⊛	A fine large brilliant cluster.	Gemini.	12
35	6 14 30	4 41	N.		D.	8 Monocerotis, 3rd class.	Monoceros.	18
36	6 48 0	13 50	S.		D.	μ Canis Majoris, 1st class.	Canis Maj.	18
37	6 54 55	8 9	S.	M. 50	⊛	Beautiful cluster of large stars.	Monoceros.	18
38	7 9 36	22 17	N.		D.	δ Geminorum, 3rd class.	Gemini.	12
*39	7 23 44	32 15	N.		D.	Castor, 3rd class. Superb *Binary* star. Period of revolution 262 years.	Gemini.	12
40	7 31 48	26 26	S.	Δ′ 53	D.	κ Argûs. Superb D. star 3rd class.	Argo.	18
41	7 34 16	14 25	S.	M. 46	⊛	A very singular object. A cluster of stars which has witbin it a planetary nebula, *if* the 10 feet will shew it, wbich is doubtful.	Officina Typographica.	18
*42	7 34 38	17 50	S.	IV. 64	○	A beautiful planetary nebula, 12 or 15′ in diam.	Argo.	18
*43	8 2 27	18 10	N.		D.	ζ Cancri. Triple ⊡ 1st and 3rd classes. The close small star revolves about the larger in 55 years.	Cancer.	13
44	8 16 18	27 30	N.		D.	φ ² Cancri, 2nd class.	Cancer.	13
45	8 36 23	29 23	N.		D.	ι Cancri. 4th class. Strongly contrasted colours. Large star yellow, small deep blue.	Cancer.	13
46	8 42 8	12 30	N.	M. 67	⊛	An immensely rich cluster.	Cancer.	13
47	9 40 50	69 55	N.	,, 81,82	N.	A nebula 15′ long in Ursa.	Ursa.	6
*48	10 10 35	20 42	N.		D.	γ Leonis. A most beautiful close double star. Rather difficult. *Binary.* Period of revolution probably about 700 years.	Leo.	13
*49	10 16 49	17 48	S.	IV. 27	○	A beautiful planetary nebula, 40″ or 1′ diameter, like Jupiter.	Hydra.	19
*50	11 8 48	32 30	N.		D.	ζ Ursæ Majoris 1st class. *Binary.* Period well ascertained 58¾ years. One of tbe most remarkable D. stars. Rather difficult, being only 2″ apart.	Ursa.	6

	R. Ascension.	Declination.	N. or S.	Authority.	Obj.	Description of Object.	Constellation.	No. of M.
	h. m. s.							
51	11 11 30	13 56	N.	M. 66	N.	A very bright lengthened nebula.	Leo.	13
*52	12 16 50	62 7	S.	Δ′ 123	D.	α Crucis, 2nd class. The brightest and most remarkable double star in the southern hemisphere†. Barely rises above the Calcutta horizon, high enough to be tolerably well seen. † α Centauri excepted.	Crux.	20
53	12 27 52	26 55	N.	V. 24	N.	A long sword-shaped nebula.	Coma Beren.	7
*54	12 33 3	0 31	S.		D.	γ Virginis. One of the most remarkable of the *Binary* stars. Period of revolution 513 years. Close and difficult, and becoming more so.	Virgo.	14
*55	12 33 56	33 29	N.	V. 42	N.	A very long narrow nebulous ray.	Canes Venatici.	7
56	12 47 9	39 16	N.		D.	α Canum. Cor. Caroli, 4th class. Contrasted colours.	Canes Ven.	7
57	12 48 32	22 36	N.	M. 64	N.	A nebula with a nucleus and a black recess.	Coma Ber.	7
58	13 4 47	19 7	N.	M. 53	⊕	A condensed globe of stars.	Coma Ber.	7 14
59	13 7 4	42 58	N.	M. 63	⊘	A very bright extended mass of stars like the finest dust.	Canes Ven.	7
60	13 15 3	28 58	S.	Δ 628	⊕	A globular cluster suddenly condensed toward the centre to an extraordinary degree.	Centaurus.	19
**61	13 16 0	46 34	S.	Δ 440	⊕	ω Centauri—not a star, but a very large and splendid globular cluster—the finest in the southern hemisphere.	Centaurus.	19
**62	13 22 40	48 3	N.	M. 51	⊙	A most wonderful object. A globe surrounded by a double ring of nebula.—It has a neb. near it, as a companion. It is *unique* in the heavens.	Canes Ven.	7
63	13 34 49	29 13	N.	M. 3	⊕	A much compressed cluster.	Canes Ven.	7
64	13 58 11	55 13	N.	M. 101	N.	A very bright nebula.	Ursa Maj.	6
65	14 10 27	57 40	S.	Δ′ 159	D.	γ Centauri, 3rd class, 5 and 8 m.	Centaurus.	20
*66	14 28 0	60 6	S.	Δ′ 165	D.	α Centauri, 4th class, 1st and 4th magnitudes. Distance 19.″ The brightest double star in the S. hemisphere. Very low in the S. horizon, but may be occasionally pretty well seen.	Centaurus.	20

	R. Ascension.	Declination.	N. or S.	Authority.	Obj.	Description of Object.	Constellation.	No. of M.
	h. m. s.							
67	14 37 34	27 48	N.		D.	ϵ Bootis. A delicate but beautiful object. Small star. Blue. 1st class.	Bootis.	7
68	14 51 8	32 21	S.	Δ 611	⊙	A star 7 8 m. with a nebulous burr round it.	Lupus.	15
69	15 10 6	2 42	N.	M. 5	⊕	Very compressed globular cluster, diameter 7 or 8′. A fine object.	Libra.	14
70	15 32 8	37 11	N.		D.	ξ Coronæ.	Corona.	7
71	15 46 1	33 30	S.	Δ' 196	D.	ζ Lupi. An elegant D. star.	Lupus.	15
72	15 55 0	19 18	S.		D.	β Scorpionis.	Scorpio.	15
73	16 6 49	22 31	S.	M. 80	⊕	A very compressed beautiful globular cluster.	Scorpio.	15
**74	16 36 22	36 47	N.	M. 13	⊛	One of the finest and most condensed of all the globular clusters between η and ζ Herculis.	Herculis.	8
*75	16 37 18	24 7	N.	Struve.	○	Very bright planetary disc, 6″ in diameter.	Hercules.	8
*76	16 43 6	47 55	N.	IV. 50	○	Very bright planetary nebula 4′ diameter.	Hercules.	8
77	16 48 22	3 49	S.	M. 10	⊕	Beautiful cluster of very small stars.	Ophiuchus.	9
78	16 52 10	26 0	S.	M. 19	⊕	A compressed cluster, 4′ or 5′ diameter.	Scorpio or Ophiuchus.	15 9
79	17 6 54	14 35	N.		D.	α Herculis. Contrasted colours.	Herculis.	8
80	17 9 6	18 18	S.	M. 9	⊕	Very large bright ⊕ of extremely small stars.	Ophiuchus	9 15
*81	17 13 1	43 18	N.	M. 92	⊕	A globe of stars crowded together beyond imagination.	Herculis.	8
82	17 19 1	23 37	S.	IV. 11	○	Pretty bright, 30″ diameter. A well defined planetary disc.	Ophiuchus.	9 15
83	17 23 40	44 38	S.	Δ 457	⊙	A nucleus, 15″ surrounded by a nebulous atmosphere, 5′ diameter.	Norma et Regula.	15
*84	17 52 1	23 2	S.		D.N	A 1st class *double star* in the centre of a *triple nebula*. N. B. The star is *triple*.	Sagittarius.	15
85	17 53 47	22 28	S.	M. 21	⊛	A rich cluster of large stars.	Sagittarius.	15
86	17 55 14	43 38	S.	Δ 473	⊕	Globular cluster, 3′ diameter. Excessively compressed at the centre.	Telescopium.	0
*87	17 56 6	2 33	N.		D.	70 Ophiuchi. *Binary ;* period of revolution about 80 years. One of the most remarkable of the well ascertained *Binary systems.*	Ophiuchus.	9
88	18 0	66 38	N	IV. 37	⊙	35′ diameter. Edges hazy.	Draco.	3

	R. Ascension.	Declination.	N. or S.	Authority.	Object.	Description of Object.	Constellation.	No. of Map.
	h. m. s.							
*89	18 3 48	6 50	N.	Struve.	○	A very bright planetary disc, 5″ diameter.	Scutum Sobieski.	9
90	18 10 45	16 15	S.	M. 17	N.	The 10-feet will probably only shew this as an oval nebula, but its true shape is  and it is one of the most curious objects in the heavens.	Scutum Sobieski.	15 9
91	18 19 37	32 31	S.	M. 69	⊕	Very bright and pretty large.	Sagittarius.	15
92	18 25 41	24 3	S.	M. 22	⊕	Very large globular cluster, 8′ diameter.	Sagittarius.	15
*93	18 38 6	39 30	N.		D.	ϵ Lyræ. A double — double star, each pair, being a *Binary*, and probably the whole a compound quarternary system: a very pretty object, and very easily found.	Lyra.	8
94	18 41 59	6 28	S.	M. 11	⊕	The cluster in Antinous.	Antinous.	9
*95	18 48 10	32 50	N.	M. 57	◎	An elliptic ring—a most singular object. Is easily found, as it lies hardly half way between β and γ Lyræ, and is visible in the finder (but *barely*).	Lyra.	8
*96	19 23 52	27 37	N.		D.	β Cygni. A beautiful coarse double star of finely contrasted colours.	Cygnus.	8
97	19 28 55	31 20	S.	M. 55	⊕	Very large rich cluster, 9′ diameter.	Sagittarius.	15
*98	19 34 6	14 33	S.	IV. 51	○	10″ or 15″ diameter. Considerably bright.	Sagittarius.	15
**99	19 52 48	22 20	N.	M. 27	N.	A most extraordinary object. A nebulous mass, shaped like a dumb bell, and involved in an elliptic faint atmosphere. N.B. The 10-feet reflector will not shew the atmosphere, but the body will be well seen.	Vulpecula.	8
100	19 58 56	22 24	S.	M. 75	⊕	Very bright, large, round.	Sagittarius.	15 16
101	20 15 5	19 33	N.	IV. 16	○	45″ diameter. Round, pretty bright.	Do.	8
102	20 25 17	7 10	N.	I. 103	N.	Very beautiful, large, easily resolveable.	Delphinus.	10
103	20 38 8	15 29	N.		D.	γ Delphini.	Delphinus.	10
104	20 54 56	12 1	S.	IV. 1	○	One of the largest and finest of the planetary nebulæ, near ν Aquarii, by which it is easily found.	Aquarius.	16

	R. Ascension.	Declination.	N. or S.	Authority.	Object.	Description of Object.	Constellation.	No. of Map.
	h. m. s.							
105	20 59 17	37 55	N.		D.	61 Cygni. *Binary* period about 400 years. This star has a very great proper motion in the heavens, and the two go together.	Cygnus.	8
106	21 22 4	11 26	N.	M. 15	⊕	In Equuleus. A fine object.	Equuleus.	10
107	21 24 58	1 33	S.	M. 2	⊕	A very condensed fine cluster.	Aquarius.	16
108	21 37 18	37 10	N.			A beautiful ruby star 9 m.	Cygnus.	10
109	22 19 8	0 55	S.		D.	ζ Aquarii, 3rd class—(fine.)	Aquarius.	16
110	23 17 31	60 38	N.	M. 52	⊕	A beautiful cluster, 12′ diameter.	Cepheus.	10 3
111	23 17 55	41 36	N.	IV. 18	○	Superb planetary nebula in Andromeda.	Andromeda.	4
112	23 30 0	47 36	S.	Δ′ 251	D.	θ Phœnicis 6 and 6m. 3.″	Phœnix.	20
113	23 49 16	55 48	N.	VI. 30	⊙	Beautiful compressed rich cluster.	Cassiopeiæ.	4

VIII.—*Description of a Compensation Barometer, and Observations on Wet Barometers. By* J. Prinsep, *Sec. &c.*

Where a daily register of the Barometer is kept, it becomes a serious labour to apply the correction for temperature to every observation: this inconvenience has led to the suppression of the correction altogether in the tables published at the Surveyor General's office; but whoever may have occasion to use these valuable meteorological records must himself reduce the indications of the Barometric columns to the freezing point, and therefore little is gained by omitting the correction in the first instance.

With a stationary barometer, in a climate liable to but small and regular alternations of atmospherical pressure, it is very easy to avoid all this labour, by attaching a compensation tube for the adjustment of the index point. I have been in the habit of using one with the instrument of which a register is kept at the Assay Office, and as it is very simple and easily made, I shall beg leave to describe it, referring to the drawing of it in fig. 3, Plate VIII.

The height of the mercurial column in a barometer depends directly upon the weight of the atmosphere, and inversely upon the density, or specific gravity, of the quicksilver, which is liable to alteration by

Temperature

Tension of Vapour

fig1 page 194

212

210

200

190

180

170

160

30 inches

D, Dalton
S, Southern
U, Ure
R, Robison

Experimental Curve
Robison's Formula
Tredgold's Formula

fig 4

fig 2

fig 3

Revd. Wollaston's
Thermometric
Barometer

fig 5

Prinsep's Compensation Barometer

change of temperature. When the accurate pressure of the air therefore is required, the height of the column must be reduced to what it would be at some fixed temperature; and the freezing point, 32° Farh. has been universally adopted for this purpose.

Suppose, therefore, by the side of the barometer tube another truly cylindrical tube of glass to be arranged (as in the plate), closed at its lower end, and having mercury filled in to the same height as that in the barometer: it is evident that this mercurial column will expand and contract with heat and cold, (or alter its density) in the same proportion as that within the barometer itself; and if the scale of inches be connected with an index-mark or sight capable of sliding on the second—or, as it may be called, the *compensation* tube, so as to afford the means of adjustment with the variable surface of the mercury within the latter, the barometrical height will be read off at once with the requisite correction. It may be objected, that a different length of mercurial column will require a different length of compensation tube; but where, as in India, the utmost variation of the pressure does not exceed one inch, nor the variation of temperature, 40 degrees; the trifling error from this cause may be neglected; for the expansion of mercury being 0.0180 from 32° to 212°, or .0001 per degree, we have the expansion of 30 inches for 40 degrees $= .0040 \times 30 = .120$.
ditto for 29 inches, $.0040 \times 29 = .116$.

extreme difference, .004
which is not more than the usual errors of observation.

There is another point to be attended to, however, in which the celebrated meteorologist Daniell was at fault, until corrected by Gay Lussac. On account of the expansion of glass with heat, mercury will appear to expand *less* in a glass tube than it actually does expand in the proportion of $\frac{1}{6}\frac{1}{4}\frac{1}{8}$ to $\frac{1}{5}\frac{1}{5}\frac{1}{5}$*: that is, in the example given above, the expansion in the compensation tube of 30 inches long, for 40 degrees, instead of .120 will only be .103; whereas in the barometer, which is open to the cistern below, the height of the mercury is determined on hydrostatic principles, and is altogether independent of the dimensions of the glass tube. To obviate this source of error, the length of the compensation column must be increased in the above ratio of 555 to 648, or where the barometer stands on an average at 30.000 inches, the compensation column must have a length of $30 \times \frac{6}{5}\frac{4}{5}\frac{8}{5} = 35.0$ inches.
where the mean height is 29 inches the length will be

* Many mountain barometers have an ivory scale of correction for mean expansion of mercury *and glass*, which the makers have probably copied from Daniell's original scale and have not since rectified.

for 29 inches..... 33.8
28 ditto..... 32.5
27 ditto..... 31.3 &c.

But, should such length be inconvenient, advantage may be taken of tubes that are not quite cylindrical, by placing the tapering end uppermost, and calculating the effect of the excess of mercury below upon the range of the narrower part of the column: thus, in the instrument of which the drawing is given, 32 inches was the compensating length required.

To prove that the indications of this instrument were equally trustworthy with the equated results of a common barometer, a series of comparisons was made both with the Surveyor General's standard instrument (through the medium of the printed register) and with an excellent Dollond's barometer placed close to mine: the results were as follows:

My barometer lower than Surveyor General's in June, 1832.	—.043	
in March, 1833.	—.044	
Ditto lower than a Dollond's barometer,....in Nov. 1832.	—.101	
in April 1833.	—.102	
12 comparisons at 10 A. M. in May gave..... .....—.093	Therm. 86.3	
10 Ditto at 4 P. M. ditto ditto..... .....—.093	88.7	

These accordances at opposite seasons of the year are sufficient to establish confidence in the *compensation barometer*. I should add, that am indebted to Mr. Barrow, H. C. Instrument maker, for carrying my views into practice, and adapting the slow-motion screws and clamps in a neat and efficient manner.

While on the subject of barometers, I would take occasion to caution all observers who are in the habit of using Englefield's open tubes, that they should only be filled with mercury when the air is in a very dry state. This remark was elicited by a series of experiments made by Lieutenant Waugh of the Engineers, when comparing his stock of Englefield barometers, with my standard, before his departure on survey to the hills of *Amerkantak*.

One tube having been filled with every precaution was found to stand 0.211 lower than the standard Barometer. It was emptied and refilled: it then stood, ... —.499
a third time refilled, ... —.609
a fourth, ... —.652
a fifth, ... —.659
a sixth, ... —.653
a seventh, ... —.700

an eighth,..... —.687
a ninth time,..... —.702

It is needless to say, that in all these cases every care was taken to exclude air. It appears, therefore, that after filling two or three times, the mercurial column stood nearly .70 too low. The hygrometer at the same shewed that the aqueous tension was .60, which so nearly agreed with the former (making allowance for capillary action), that we had no doubt at the time that the depression was caused by moisture, attracted by the tube from the air, the frequent renewal of which allowed the surface of the glass to attain a state of hygrometric equilibrium with the latter. That such was the case was further proved by repeating the operation on a subsequent day, when the air was much drier; the hygrometer then shewing a tension of .45, the barometer stood between .394 and .415 lower than the standard.

It is well known how pertinaciously water adheres to the surface of glass: in damp weather an electrical machine cannot be worked unless dried by heat; and any glass tube, even in dry weather, if heated in one part, will shew the presence of water by a condensation of minute globules in the colder parts of the tube. Such facts, in conjunction with the positive testimony now adduced, prove that implicit reliance should not be placed upon this kind of barometer, especially for the measurement of heights. The different quality of the glass may also have great influence on the aqueous action, according to the predominance or otherwise of alkali in its composition.

Mr. Faraday has recommended that borax should be substituted for alkali in the composition of glass for astronomical purposes, on account of the liability of the alkaline glasses to injury by the wet, but we have not yet seen any notice of the result of such trial on a large scale. Perhaps the barometrical effect now noticed might be turned to advantage, as a mode of measuring the hygrometrical quality of glasses of different founts. Of five dry tubes of the same bore, filled together and placed upright in the same reservoir of mercury, no two were found to agree together, whereas upon wetting the interior of the same tubes, they then agreed very well together, and (after making correction for the aqueous tension corresponding to the temperature of the mercury) also very nearly coincided with the standard barometer, without any allowance for capillarity.

This circumstance suggested an easy and certain method of turning the tubes to account in the survey, namely, to use them *always wet* and make the necessary addition. The most defective and dirty tube might in this way be rendered as serviceable as the cleanest, and I

would certainly recommend those who possess such tubes to use them in this manner. It is besides much easier to free them from air. All that is necessary being to fill the tubes first with water that has been well boiled, and then to pour in the mercury, allowing it to drive out the water as far as possible before inverting the tubes. The temperature must be accurately noted at the time of registering.

Lieutenant WAUGH has promised me a series of observations with the wet barometer, which I hope ere long will be forthcoming.

IX.—*Proceedings of the Asiatic Society,*

Wednesday Evening, 29th May, 1833.

The Right Rev. the Lord Bishop of Calcutta, in the Chair.

The Proceedings of the last meeting were read.

Mr. W. M. Manuk, proposed by Babu Ram Comul Sen, seconded by Mr. D. Hare, was elected a Member by ballot.

Some matters of account were referred to the Committee of Papers.

The Secretary brought up the Report of the Committee of Papers, on the manuscripts of the late Mr. Moorcroft, put at the Society's disposal by Government in January last. It recommended the whole to be transmitted to England to be published, either the whole or a copious digest, on account of the Society, under the charge of Professor Wilson, who had kindly proffered his services in arranging the matter for the press before his departure. Mr. Trebeck, brother of the companion of Mr. Moorcroft's travels, had also presented the whole of his brother's journals, letters, and drawings, in order that the valuable information contained in them might be incorporated in the proposed digest, on consideration of his receiving 12 copies of the printed work. The meeting adopted the suggestion of the Committee, and an offer from Lieutenant Burnes to convey them to England was accepted with thanks.

Library.

The following books were presented :

Roxburgh's Flora Indica, 1st and 2nd vols.—*by Captain James Roxburgh, on the part of himself and brother, editors of the work.*

Journal Asiatique, No. 58—*from the Asiatic Society of Paris.*

Chezy's Sacountala ; Sanskrit text and French translation—*by the Translator.*

Notice de l'ouvrage intitulé 'Lettre à M. Abel Remusat—*by the Baron Humboldt.*

* Baron Sylvestre de Sacy's Recherches, sur les contes des mille et une nuits—*by the Author.*

Ferussac's Bulletin Universel, 1827-28-29, 36 vols.—*presented by Mr. F. Corbyn, in the name of Dr. Bogie.*

* The letter accompanying the above three works was dated in 1830, they were probably detained a long time in England on their way.

Stirling's Cursory Notices on the Isle of France, 1827—*by the Author.*
Meteorological Registers for March and April—*by the Surveyor General.*
From the Society's Booksellers:—
Lardner's Cabinet Cyclopedia,—History of England, vol. iii.
Ditto ———————————— Military Commanders, vol. iii.

A letter was read from Captain F. Jenkins, presenting a Burma manuscript from *Ludiya,* in the dialect of the *Kamtís,* the tribe who possess that part of Assam.

Antiquities.

Lieutenant Burnes exhibited to the Meeting his collection of ancient coins made between Cabúl and Bokhára, and an explanatory note was read by the Secretary.

Two papers were read by Lieutenant Burnes in further elucidation of the same subjects.

1. On the *Tope* or mound of Manikyala, and other similar *topes* in the *Panjáb.*

2. Account of a sect calling themselves the descendants of Alexander the Great in the valley of the Oxus.

[These will appear in a future number.]

Physical.

The following donations for the geological cabinet were presented:

1. A fragment of a large fossil bone from Jabalpúr—*by Dr. Spilsbury.*

In connection with the same subject Dr. Row writes from Benares, that he has despatched under charge of Mr. Colley a box containing a further supply of *Jabalpúr* fossil bones.

Doctor Spilsbury has since had the good fortune to make a further enviable discovery at a place about 60 miles from Jabalpúr,—the jaw of a fossil elephant with the teeth quite perfect. It remains to be seen whether this interesting specimen belongs really to the elephant or to some of the gigantic quadrupeds of the same genus brought to our knowledge by the great Cuvier; the *Mastodon* of America, which is supposed to occur in no other part of the world; the *hippopotamus* of Peru; or the *rhinoceros* of northern Asia.

Dr. Row has forwarded the section and plan alluded to by Dr. Spilsbury in his communication read to the Society at the meeting of March last.

The following specimens from Arracan—*by Mr. H. Walters, acting commissioner.*

1. Two bottles of water procured by Lieut. Mackintosh from a thermal spring found near the top of the *Aeng* pass.

2. A bottle of mineral oil or naphtha, from *Ramree.*

3. A few specimens of rocks picked up at *Ramree* and the *Aeng* pass.

4. Coal from the *Sandowy* district.

The red hill of Ramree is composed of red clay iron, enclosing nodules of steatite, of a light grey colour, black streaked steatitic iron oxyd resembling hæmatite and a conglomerate of felspar and quartz pebbles. At the foot of the hill occurs silicious breccia, which appears as if it had been an infiltration of silicious veins in the crevices of the red clay which was subsequently crumbled or washed away, the interstices being now filled with common mud.

Iron mines were worked on the island of Ramree by the Burmese, and the metal was highly prized ; but it has been driven out of the field by the cheapness of English iron in all the bazars.

The limestones and corals of Arracan are deserving of attention ; lime might be burnt and sent to Calcutta at a cheaper rate than that paid for the Silhet lime.

The sandstone of Ramree is of a softer nature than the best of Chunar ; it resembles the Mírzapúr quarry, and is well adapted for minute and sharp sculpture.

The specimens from the *Aeng* pass are quartz rock, indurated clay, and decomposed talc-schist. A coarse granular limestone is stated to be very common in the Sandowy district.

The coal from the *Kingtellie* circle in the same district, is a very rich lignite, shewing the woody structure in great perfection : it has a spec. grav. 1.308, and gives out much bitumen and gas on ignition. The coke was small in quantity but good.—

Composition.		
	Volatile matter, ...	66.4
	Carbon, ...	33.0
	Ash, ...	0.6
		100.0

One specimen of coal mixed up with silicious matter is said by Mr. Walters to form the substance of an entire hill.

Of the mineral water, one bottle was found to be perfectly pure, sp. gr. 1000 and not acted on by tests : the other contained a large deposit of yellow ochreous silt.

Specimens of coal discovered in the lower range of hills in the North Moradabad district—*by Mr. E. J. Ravenshaw, collector, Bijnore.*

The following extracts from Mr. Ravenshaw's letters illustrative of this discovery, and of the presence of gold in the streams of his district were read.

Himálayan Coal.

" I had lately an opportunity of paying a rapid visit to the source of the coal of which I lately sent a specimen to the Society. From Judpúr, a town about 10 miles east of the *Ramgunga*, I gallopped about 18 miles to *Lâldhong*, a village at the foot of the lower range of hills, and situated on the banks of the *Phika Nadí*. The latter nine miles of the road lay through the forest, which abounds with tigers, wild elephants and other animals. In the evening I proceeded on an elephant three or six miles along the foot of the hills in an easterly direction to *Mohra Dhéla*, a village situated at the point where the river *Dhéla* issues from the hills. We traced the river about a mile within the hills, and the *nyarías* (gold-washers) whom I had previously deputed to explore these regions, pointed out in several directions thin seams of coal, varying from one to four inches broad, running along between ledges of sandstone, which was covered with a white substance (decomposed pyrites ?) The coal is also coated with a yellow substance (iron pyrites), and smells strongly of sulphur when burned.

About a mile up the river we came to a precipice about 200 feet high, composed of a heterogeneous mixture of sand, clay, and stones, (from the specimen sent it is a conglomerate with calcareous cement.) It was of various colours—red, bluish-green, but the white coating predominated over all.

The rains had washed down masses of the hill, and among these we found a great deal of the coal, in fact it seemed to abound here more than in any other part. The *nyarías* whom we sent up to scale the precipice, brought down their *kamarbands* full of it. The next morning I rode about four or five miles up the *Phíka Nadí*, and found the coal in similar situations, in veins stratified with sandstone, and occasionally conglomerate rocks. In the evening I explored the *Chala Nadí* to the west of the *Phika*, and found several large veins in the face of a perpendicular rock of the same description. I send specimens of the several varieties:—some appear to be mere lignite, but others are genuine coal. It is found however in such narrow veins as to give but little promise of a profitable application. The natives tell me that it is found in almost all the rivulets up to Hardwar, wherever the lower range is composed of *kacha* (unripe) materials: they call it *momyai*, and use it as a medicine for curing wounds, and as an infallible remedy for *Cholera!* for the latter purpose they pound up about half an inch square of it, and mixing it with a *lota* full of warm milk, drink it off."

The specimens of coal sent down by Mr. Ravenshaw are all nearly of the same character, strongly impregnated with sulphuret of iron, which forms thin fibres streaking some of them, and passes into thick masses of pyrites decomposing in others:—a clean lump had a specific gravity of 1.968 in consequence, and the residual ash was principally iron oxyd; it burns with good flame, does not coke, and retains sulphur enough to ignite spontaneously after being charred.

Volatile matter, ...	35.4
Carbon, ...	50.0
Ferruginous ash, ...	14.6
	100.0

Gold.*

Mr. Ravenshaw in other communications of a recent date, mentions a discovery that all the rivers and streams descending from the same range of hills are impregnated with gold. The river in which it is most abundant is the *Koh*, which flows a few miles to the east of *Naginah*, and falls into the *Ramgunga*, four or five miles below *Sheakdí*. "There are two parties of *nyarías* or gold-workers on this river, one at *Kot,kádír*, twelve miles from *Kot,dwar*, whence the *Koh* issues from the hills, and the other about ten miles lower down opposite to *Barapura*. At the former the *nyarías* pay 50 rupees per mensem to the *zemindár*, and at the latter 30 rupees. At *Lakherghaut* on the *Ramgunga*, about four miles from the hills, another party is established, and a fourth to the eastward at *Amangarh* on the banks of the *Phika Nadí*, a tributary of the *Ramgunga*.

* The reader will find some valuable remarks on the gold of the Ramgunga tributaries by Captain Herbert, in his notice of Himálayan minerals printed in the *Physical Researches Asiatic Society*. He notices the same curious fact of no gold being discovered in these streams until they enter the lowermost range of hills:—he also mentions having a specimen of the gold in its parent rock, but properly concludes that although we may be certain of the existence of the metal within this range, we must patiently wait until the progress of population and industry shall press upon the hitherto unexplored resources of the mountains ere we reap the advantage of our knowledge. An individual might be ruined in the search, unless indeed some lucky chance should give him a prize in the mining lottery.

In the above rivers the gold is found at all periods of the year, but in the *Dhéla*, about 10 miles to the eastward, it is only found in the rains. The *nyarias* live at *Kheloroli*, about seven miles north of *Kásípúr;* but the site of their researches is about six miles higher up the river, between *Sheonáthpúr* and the hills. A tax of 2rs. 8ans. is levied upon each *katouti* or washing-trough, which (in the absence of any other *zemindár)* is paid to Government. The gold found in this stream is said to be of a finer quality than that of any of the other rivers.

In the rivers to the eastward of the *Dhéla*, viz. the *Kosillah*, *Dabka*, &c. no gold has been discovered; I have no means of ascertaining whether it exists in the sands of the rivers in the *Barelly* district.

It is evident that these golden sands must have a source, and as they have probably flowed for centuries from the mountains it is presumable that source is extensive. The uniformity also with which it is found in all the streams from the *Ganges* to the *Kosillah* where it ceases, seems to indicate the existence of a vein of ore more or less interrupted, co-extensive with the above limits. Gold-dust is found on the other side of the *Himálaya* also: the *Bhotias* bring it with their borax from *Hundés*, where it forms the currency under the name of *phátáng*, (a small lump of gold-dust melted into a lump, value eight rupees.) I have employed an intelligent *nyaría* to search the small rivers to their source in the first or second range of hills, to wash the sand and mark where the gold-dust ceases, and to bring away specimens of the rock on either side. He is also instructed to look for coal."

A minute portion of gold is found in the sands of most rivers, but it is seldom plentiful enough to make it worth the labour of extraction. In the *Indus*, the *Irawadi*, the *Ningthi*, and the *Brahmupútra* rivers, the process of washing is practised with success, but it can only be undertaken where labour is cheap. A specimen of the washed sediment extracted from 40 maunds of the sand of the *Brahmapútra*, lately sent by Mr. W. Cracroft, weighed 396 grains; from this the magnet separated 147.3 grains of magnetic oxyd of iron: the remainder digested in boiling nitro-muriatic acid yielded 1.9 grains of gold, in value about 2½ annas.

Specimens of the limestone rocks of *Sehwan* and of the banks of *Indus* at and east of *Tatta*, of the *Jesalmir* yellow limestone, and of the bituminous limestone of *Persepolis—by Lieut. A. Burnes.*

The limestone of the *Indus* resembles much that of the *Silhet* hills:—it appears also to contain shells: the specimen from the top of the *Sehwan* mountains is more crystalline, and of a yellow colour like that of *Jesalmír*, of which a description is given in the GLEANINGS, vol. iii. p. 108.

The limestone of Persepolis, used for most of the buildings of that ancient town, is of a dull brown colour and semiconchoidal fracture; it emits when rubbed a strong bituminous smell.

Specimen of the granite of *Abu* in *Guzerat*, and of limestone between the *Oxus* and *Bokhára—by the same.*

The latter is an oolitic limestone, the first which has been discovered in India, of fine small grains about as large as mustard-seed. It is compact and capable of being quarried.

Belemnites from the eastward of the *Aral*, and a small fossil bivalve from *Bokhára—by the same.*

The shells are converted into a solid of white marble; they are used in medicine by the Persians; the under valve is worn round as if from grinding.

Specimen of the *Indus* Coal—*by the same,* from *Kohat* near *Pesháwar.*

The following note on the subject by Lieut Burnes was read:

Pesháwar Coal.

On my arrival in the plains of *Pesháwar* in March 1832, I made various inquiries from the *Doorani* chiefs of the country regarding coal and other minerals. They did not comprehend the meaning of coal, but Peer Muhamud Khan, the chief, who holds *Cohut* on the southern boundary of the plain, informed me that there were wells in the petroleum or naphtha in *Cohut,* and that the people used the substance in lamps instead of oil. He also told me that within these few months, the villagers had found that the stones near these pits were available as fuel. At my request he despatched a messenger, and brought the specimen of coal which I now present to the Society. It has been taken from the surface, and can give therefore no correct idea of the substrata further than proving that coal exists in the neighbourhood. The coal is slaty and of a greyish-brown colour, it readily ignites at the candle and emits a sulphureous smell.

The discovery of a coal-mine at the head of the *Indus* may prove of the utmost importance in these times, since the navigation of that river is open from the sea to the town of *Attok,* which is only forty miles distant from the deposit. An excellent road intervenes, and *Pesháwar* is a large city where labour is cheap.

It is a singular circumstance, that coal should have been discovered both at the mouth and head of the Indus (in *Cutch* and *Cohut*) within these few years, and since steam has been used in India. It is seldom that discoveries are so well-timed, and I trust that they augur favorably for the opening of a new route of commerce by the *Indus.*

The *Indus* coal is little better than bituminous shale—slaty and dull in structure and appearance: specific gravity 1.670: burning freely in a candle—not coking, and leaving a large quantity of brown earth on incineration. Its composition on analysis proved to be,

Volatile matter, ...	37.0
Carbon, ...	6.2
Earthy matter,.....	56.8
	100.0

It is most probable that where this shale is met with, coal of a superior quality may also be found.

X.—*Miscellaneous.*

1.—*Rustic Bridge.* Pl. X.

The accompanying is from a hasty sketch, taken in the April of 1831. It represents one of two bridges similarly constructed, which were thrown across the Jámna, at a place where that river is divided into two branches by an island. These bridges were for the convenience of communication to some iron-smelting works, situated on the right bank of the river, at some distance below the bridge erected by Major Young, where the Simla and Massúrí road crosses the Jámna.

As there is ingenuity displayed in their rough Shakesperian mode of construction, I am induced to send you this sketch, which I trust is sufficiently intelligible to supersede the necessity of a description. No rope was employed, the different

parts being bound and suspended by strong twisted withes. The bridges were as may be supposed very vibratory, but were sufficiently strong to admit of the hill men carrying their loads of iron or charcoal across them with safety.

If this short notice of a somewhat ingenious and picturesque object is worth publishing in the JOURNAL OF THE ASIATIC SOCIETY, it is very much at your service.

NOTE.—We are always happy to give insertion to notices of this nature, and especially of the simple inventions and processes of the natives. In the present case, we regret that our correspondent has not given us the dimensions and span of his rustic bridge.

2.—*Remarks on the Paper on the Trisection of an Angle in No.* 14 *of the* "JOURNAL OF THE ASIATIC SOCIETY."

The difficulty of the problem is touched on in the second proposition of the paper in question, which is as follows: "To draw the base of a triangle so that of the interior angles at the base, one shall be double of the other, the vertical angle of the triangle being a given rectilinear angle, greater than half a right angle."

The construction is, to take B F=2 B A, inflect A C=3 A B, from the point A on B C, and make B C=B F ⅓ F C. The writer has failed, as he admits, in his first attempted demonstration of this construction, nor in his supplementary emendation of it is he more successful. The phrase "*which it does not,*" in line 12th, and repeated in line 14th, is mere assertion; the eighteen following lines are superfluous; for if the angle K D G is a right angle, the question is settled.

A numerical example or two will perhaps be the easiest way of convincing Mr. Morrieson of his failure.

Suppose then B=90° B G A is by hypothesis 30° and calling A B=1 A G will be equal to 2, and B G=$\sqrt{4-1}$=$\sqrt{3}$=1·7320508; but A C=3, B C=$\sqrt{9-1}$ =$\sqrt{8}$=2·8284271 and B F=2 to B C—B F=·8284271, ⅓ of which is ·2761423, and this taken from 2, leaves 1·723577, the length of B G by Lt. Morrieson's shewing; but it ought to be 1·7320508.

If B be taken=45, the limit of Mr. M.'s problem B G will come out by Mr. M.'s construction=1·65363908, but it ought to be 1·4142136.

If 60 be taken, the difference is smaller again; B G ought to be 1·53207, whereas Lt. Morrieson's construction makes it 1·542579, &c. On the whole the metbod is a very good mechanical rule for trisecting an angle; matbematical solution it is not. Mr. M. has hit on the difficulty in the problem which is "to draw the base of a triangle, so that of the angles at the base one shall be double of the others."—In different words, the problem comes to this, "To draw a line G A such that G D shall be equal to the radius of the circle which has B as a centre and B A as a radius," and this rule will answer in all cases where B is equal to 45, D and A coincide when greater D falls between A and G, when less D falls beyond A, and further from G'.

But the problem is not to be solved by straight lines and circles: if a conchoid (pl. ix. fig. 2) having A for its pole and B C for its assymptote be described, it will cut the circle A D E in the points D, D' and D'' and straight lines joining these points with A, or their extensions will form with B G triangles B G A, B G' A, B G'' A, &c. of the species required. This follows from the nature of the curve, in which G D is a constant quantity, and here equal to B D the radius of A D E.

D E drawn parallel to I H gives I E an arc which measures ⅓ of A B G' D' E'

gives H E′ which measures ⅓ of A B C the supplement of the former and D″ E″ gives H E′=⅓ A B H considered as valued at B or of ⅓ (A B I+1 8). The point *A′* corresponds in some degree to a pole and D, D′, and D″ if joined from an equilateral triangle, as a little consideration will shew.

Tirhoot, 27th March, 1833. L. D.

Capt. Alfred Burton, if I am not mistaken, employs for the trisection of an angle a cardwide of which the generating circle is E A D and the constant quantity A B. This curve at any rate answers very well, as will be evident on construction.

3.—*New Patent Improved Piano-Forte.*

Mr. T. Loud, jun. of Philadelphia has invented a new and useful improvement in the horizontal Piano Forte, whereby the tone is greatly improved, the instrument is less subject to get out of tune, and the strings are less liable to break, for which invention and improvement he has taken out a patent.

The improvement consists in placing either the action above the strings, or the strings and bridges turned upside down above the action. So that the hammer in striking the string shall act in the direction of the bridge, instead of as at present in an opposite direction. Upright Piano Fortes, it may be noticed, are already in possession of this improvement.—*Arcana of Science and Art.*

We are not disposed to consider this improvement (for an improvement it is, as far as *tone* is concerned) at all efficacious in preventing the instrument going out of tune. Every one who knows any thing of the Piano knows that it is by the slipping of the round iron pegs in their wooden sockets that a piano gets out of tune; the extraordinary thing is that for an evil the source of so much vexation and annoyance no remedy should have been yet discovered for, or we should rather say applied by the trade: the remedy is in reality as obvious, as is the interest of that trade to avoid applying it. We have seen the piano of a gentleman in Calcutta, much strengthened and improved by the adaptation of a cast-iron case to the front block in which the pegs are inserted; in fact if the whole frame could be made of a triangle of cast-iron, the piano would be infinitely more durable than it is at present, although it is probable that its tone might be prejudiced.

We must confess, however, that within the last few years, many real improvements have been introduced in the adaptation of the Piano to the vicissitudes of our Indian climate: the metal bars, thrown across in the direction of the strain, tend materially to prevent the instrument form warping, and by themselves expanding and contracting with heat and cold in the same ratio nearly as the wires, they keep the latter under an uniform tension, and consequently always in tune; whereas those Pianos, which depend upon a wooden frame alone, require to be tuned with every change of weather. Another real improvement in small Pianos has been the introduction of the metal plate, to which all the wires are attached: the advantages gained by this construction are twofold, the sounding board is left free underneath, and the strings of the upper octaves are deprived of that long neutral space between the fixed pegs and the bridge, which always caused the upper notes of these instruments to flatten much faster than the lower octaves. In fact, the liability to stretch or slip, and the chance of flaws or imperfection of elasticity (which are the only causes of getting out of tune), being in direct proportion to the length of wire, every wire should have the same proportion beyond the bridge to maintain uniform tune. Some makers have ingeniously made use of the tail pieces of the wires, in grand pianos, to produce a doubling of the tone; the wires beyond the bridge have precisely the same length to the fixed pegs as before the bridge, or within the action: on raising

by means of a pedal the damper that usually covers them, the sound will be doubled by the reciprocal vibration of the extra strings: the thought has much ingenuity, and all that can be urged against it is that the bulk of the instrument is somewhat increased, and with it the chances of derangement and getting out of tune.

4.—*Specific Gravity of Metallic Alloys.*

In the second number of Brewster's Journal N. S. are some curious results obtained in experiments on the melting points and densities of different alloys, by M. Kupffer. It appears that in every proportion of tin and lead from one of tin with one of lead, to one of tin with four of lead, and from one of tin one of lead to six of tin one of lead, there was expansion, i. e. the specific gravity of the alloy was found to be less than that given by calculation. At two of tin one of lead, and still more at three of tin one of lead, the difference was trifling; and as the difference increased each way it was conjectured that at some intermediate proportion between those two, the resulting specific gravity would agree with the calculation. It was found that *one volume* of lead to *two* of tin gave a specific gravity almost exactly that of calculation.

In amalgams of tin and mercury, again, contraction was found to take place; it being null when one combining volume of tin was added to two of mercury. In amalgams of lead and mercury the least contraction is found when one combining volume of lead is united to three of mercury.

The following melting points were observed:

			Centigrade	*Fahrenheit.*
Lead,				334°
Tin,				230
Tin 5 primes,	Lead 1 prime,			194
4 „	1 „			189
3 „	1 „			186
2 „	1 „			196
1 „	1 „			241
1 „	3 „			289
2 volumes,	1 volume,			194

These temperatures were determined by noting the weight of mercury driven out of a small bulb furnished with a capillary tube, in the same manner as practised by Messrs. Dulong and Petit. They will therefore require some correction. D.

5.—*Proportion of Recent and Fossil Shells.*

The following notice of the numbers of known species of recent Testaceous Mollusca and of Fossil shells is taken from Loudon's Magazine of Natural History.

	Simple univalves	Bivalves and multivalves.	Multilocular univalves	Total.
Testaceous Mullusca of the present world,	1961	874	58	2893
Species of British Fossil shells,	401	634	230	1265
Of the 1265 Fossil Species, the following is the distribution.				
1st Division, 1st Section, Carboniferous order of Mr. Conybeare,	27	80	33	140
1st Division, 2nd Section, to the Lias inclusive,	9	38	50	97
2nd Division, from the Lias upward to the Chalk inclusive,	106	375	139	620
3rd Division, Tertiary Beds above the Chalk,	259	141	8	408

The author of this paper draws the conclusion "that in proportion as we descend the vast series of deposits that overspread this portion of the earth, so do we recede, step by step, from the circle of existing organised beings, and from the phenomena attendant on their structure, their habits, and their adaptations." D.

6.—*Table of the Lengths in British Miles of the Degrees of Latitude and Longitude from 0°. to 30°. with the Areas bounded by them in Square Miles.*

Parallels of Lat.	No. of miles in a Meridional Degree.	Mean.	*a* Logarithm	No. of miles in a Longitudinal Degree	Mean.	*b* Logarithm	Sums of $a + b$	Nat. number. Square miles.
8°	68.7160			68.4870				
		68.7177	1.8370705		68.3983	1.8350434	3.6721139	4700
9	68.7195			68.3097				
		68.7214	1.8370895		68.2107	1.8338544	3.6709439	4687
10	68.7233			68.1118				
		68.7254	1.8371147		68.0025	1.8325217	3.6696364	4673
11	68.7276			67.8933				
		68.7298	1.8371463		67.7736	1.8310631	3.6682094	4658
12	68.7321			67.6540				
		68.7346	1.8371779		67.5242	1.8294582	3.6666361	4641
13	68.7372			67.3944				
		68.7398	1.8372095		67.2543	1.8277181	3.6649276	4623
14	68.7425			67.1143				
		68.7453	1.8372411		66.9641	1.8258414	3.6630825	4603
15	68.7482			66.8139				
		68.7512	1.8372790		66.6536	1.8238262	3.6611052	4582
16	68.7543			66.4933				
		68.7574	1.8373169		66.3229	1.8216642	3.6589811	4560
17	68.7606			66.1525				
		68.7640	1.8373611		65.9720	1.8193597	3.6567208	4536
18	68.7675			65.7915				
		68.7710	1.8374053		65.6010	1.8169105	3.6543158	4511
19	68.7745			65.4106				
		68.7782	1.8374495		65.2103	1.8143142	3.6517637	4485
20	68.7820			65.0100				
		68.7858	1.8375001		64.7998	1.8115750	3.6490751	4457
21	68.7897			64.5896				
		68.7937	1.8375506		64.3695	1.8086768	3.6462274	4428
22	68.7977			64.1495				
		68.8019	1.8376011		63.9197	1.8056368	3.6432379	4398
23	68.8061			63.6900				
		68.8104	1.8376516		63.4505	1.8024316	3.6400832	4366
24	68.8147			63.2111				
		68.8191	1.8377084		62.9620	1.7990785	3.6367869	4333
25	68.8236			62.7130				
		68.8282	1.8377652		62.4544	1.7955603	3.6333255	4298
26	68.8328			62.1959				
		68.8375	1.8378219		61.9278	1.7918871	3.6297090	4263
27	68.8422			61.6597				
		68.8470	1.8378850		61.3823	1.7880410	3.6259260	4226
28	68.8519			61.1050				
		68.8568	1.8379481		60.8183	1.7840321	3.6219802	4188
29	68.8618			60.5316				
		68.8669	1.8380112		60.2356	1.7798561	3.6178673	4148
30	68.8720			59.9396				

Note.—The above table was compiled in the Surveyor General's Office, and will be found of great use to Revenue Surveyors, &c. as it comprehends the latitude of all parts of the plain of India.

Meteorological Register, kept at the Assay Office, Calcutta, for the month of May, 1833.

Day of the month.	Barometer reduced to 32° Farh.				Thermometer in the Air.				Depression of moist-bulb Thermometer.				Hair Hygrometer.		Rain.	Wind.			Weather.		
	At 4½ A.M.	At 10 A.M.	At 4 P. M.	At 10 P. M.	Minimum at 4½ A. M.	At 10 A.M.	Max. by Reg. Ther.	At 4 P. M.	At 10 P. M.	At 4½A. M.	At 10 A.M.	At 4 P. M.	At 10 P. M.	At 10 A. M.	At 4 P. M.	Inches.	Morning.	Noon.	Evening.	Morning.	Noon.	Evening.
1	,642	,693	,589	,635	86,5	89,4	96,8	92,8	83,2	4,6	6,5	8,4	4,9	92	89		e.	e.	S.	clear.	clear.	hazy.
2	,587	,664	,534	,644	80,	89,5	98,	92,8	81,7	1,4	6,4	8,7	5,3	92	89		s.	s.	E.	scud.	do	storm.
3	,605	,690	,568	,661	82,1	89,5	97,	93,0	84,3	4,0	6,5	9,3	5,9	92	88		o.	S.	S.	overcast.	do	overcast.
4	,606	,654	,550	,624	83,2	89,6	96,5	92,7	85,3	5,9	7,0	8,5	6,9	91	89		s. e.	s.	S.	do	do	heavy scud.
5	,641	,716	,569	,803	83,2	90,5	98,	91,8	72,4	5,1	7,7	10,2	1,2	89	86		s. e.	s.	N. W.	clear.	clouds	heavy rain.
6	,740	,861	,765	,796	72,6	82,6	80,	81,7	75,7	2,9	6,5	5,7	2,3	90	95	1,64	N.	N. E.	N.	cum. str.	rain	cir. cum.
7	,686	,802	,685	,800	73,4	82,7	90,	85,8	80,0	1,6	5,0	7,5	5,2	96	89		n.	o.	o.	haze.	clear,	clear.
8	,704	,837	,728	,854	80,0	86,3	93,	87,8	78,3	3,0	6,5	10,3	5,3	92	85		o.	o.	S.	do	do	do
9	,779	,802	,740	,795	71,0	85,7	93,3	88,4	81,2	4,2	10,0	10,5	3,7	80	84		n.	s.	o.	cloudy.	do	do
10	,788	,814	,680	,732	78,0	86,1	94,	90,2	81,2	3,0	7,5	10,7	4,8	89	85		o.	s. w.	S.	do	do	do
11	,727	,776	,676	,754	80,0	88,2	95,3	90,9	83,0	3,2	9,5	13,0	5,3	86	79		o.	s.	S.	clear.	do	do
12	,730	,793	,644	,672	81,0	88,7	96,7	92,0	83,8	3,7	6,8	10,0	5,7	90	86		E.	S.	S.	do	do	do
13	,737	,723	,622	,718	80,2	88,3	97,5	93,4	84,0	2,0	6,8	10,8	5,4	91	84		s.	S.	S.	do	do	lightning s. e.
14	,593	,738	,663	,656	73,1	89,1	105,	89,7	78,0	2,5	9,3	7,4	2,3	88	91		s.	s. e.	e.	do	rain,	clear.
15	,602	,730	,594	,658	78,2	87,5	94,2	91,2	82,8	3,0	6,5	9,0	4,0	91	88	2,00	o.	o.	s.	nimbi.	clear.	do
16	,642	,714	,593	,686	81,0	88,0	95,	90,4	82,0	2,6	6,7	10,5	5,6	91	84		s.	s.	o.	cumuli.	cumuli.	cumuli.
17	,651	,663	,556	,631	80,1	89,0	95,8	92,7	83,2	2,9	7,5	10,6	5,8	90	85		s.	o.	s.	clear	do	clear.
18	,579	,654	,504	,592	80,1	89,7	95,7	91,3	84,0	2,5	8,2	10,4	5,4	88	85		o.	o,	s.	do	do	do
19	,548	,600	,506	,551	81,6	89,0	93,	91,0	83,0	2,6	6,5	10,0	5,0	90	85		o.	o.	o.	do	do	do
20	,482	,528	,376	,400	80,1	85,0	88,	87,3	81,	3,1	6,5	7,2	3,8	95	89	0,98	N.	N.	N.	cir-cum.	rain.	threatening
21	,233	,086	,868	,076	78,0	82,2	85,	82,8	80,	2,0	3,6	8,6	4,0	93	93	2,90	NE.	N. E.	S. E.	gale	and rain.	violentgusts
22	,188	,303	,300	,407	79,5	82,5	87,5	84,3	83,1	4,1	4,0	4,0	7,1	95	96	5,34	S.	s.	s.	rain.	lowering.	cloudy,
23	,425	,494	,425	,491	82,2	83,7	90,3	84,8	82,2	4,1	2,3	4,3	3,7	98	94		S.	s.	o.	steam	f. ground.	o'rpwring.
24	,399	,391	,340	,402	83,3	88,7	95,8	87,9	88,1	1,5	4,4	3,5	3,9	96	97		s.	s.w.	o.	do	and	calm stratus.
25	,364	,400	,369	,466	85,0	87,0	97,5	89,2	88,9	2,0	2,6	3,5	4,9	98	96		o.	o.	s.	haze	all	day.
26	,439	,496	,442	,525	85,0	87,7	98,	89,8	88,1	2,3	2,8	3,2	6,3	98	97		o,	s.	n,	do	do	do
27	,486	,496	,408	,470	84,1	88,5	98,	92,2	87,4	2,7	3,5	4,7	5,9	97	96		n. e.	S.	s.	clear.	cumuli	stratus.
28	,431	,472	,338	,439	86,4	89,3	97,	90,5	87,3	4,7	4,9	4,0	3,7	95	97		S.	S.	S.	haze.	cum. cir.	cumulus
29	,409	,468	,400	,466	87,2	89,7	98,	92,8	87,0	6,2	4,7	6,7	4,0	95	92		S.	S.	S.	nimbus	do	do
30	,435	,521	,441	,510	87,2	89,7	99,	92,8	87,0	6,5	6,3	6,8	4,0	93	92		S.	s,	S.	nimbi.	do	cirri.
31	,455	,504	,426	,472	86,8	90,4	99,	95,2	87,0	6,7	5,5	8,5	4,0	94	89		S.	s,	S.	cumuli.	do	do
Means,	,565	,617	,545	,593	80,8	87,5	94,0	90,0	83,	3,4	6,1	8 ,2	4,8	95	90	12,86	variable.			oppressive heat and damp.		

The Instruments for 10 A. M. and 4 P. M. are suspended in the free air of the laboratory, and the Sunday entries are filled in by interpolation. The Instruments for 5 A. M. and 10 P. M. are observed daily in the south veranda of a house near the Cathedral. On the 21st, a hurricane overwhelmed Saugur and Kedgeree, inundating the whole country and destroying very many lives. The Barometer experienced an unprecedented fall at Calcutta, having descended to 28, 867 in. at 4½ P. M. of the 21st; after that hour, it rose gradually, and the strength of the gale occurred as usual during the rise.